March 1943

TECHNOLOGY REVIEW

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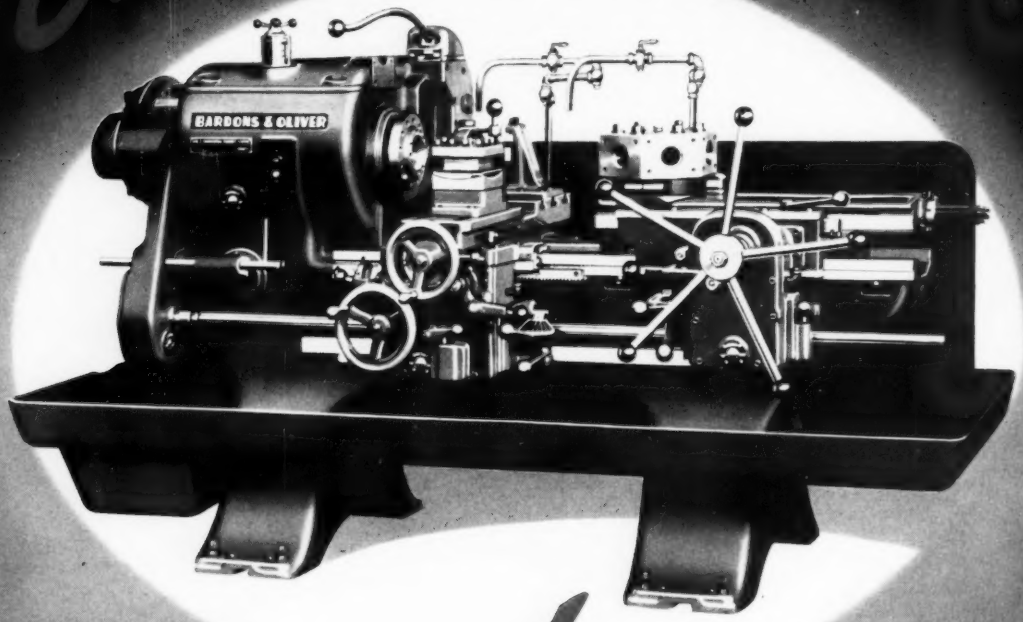
Bardons & Oliver



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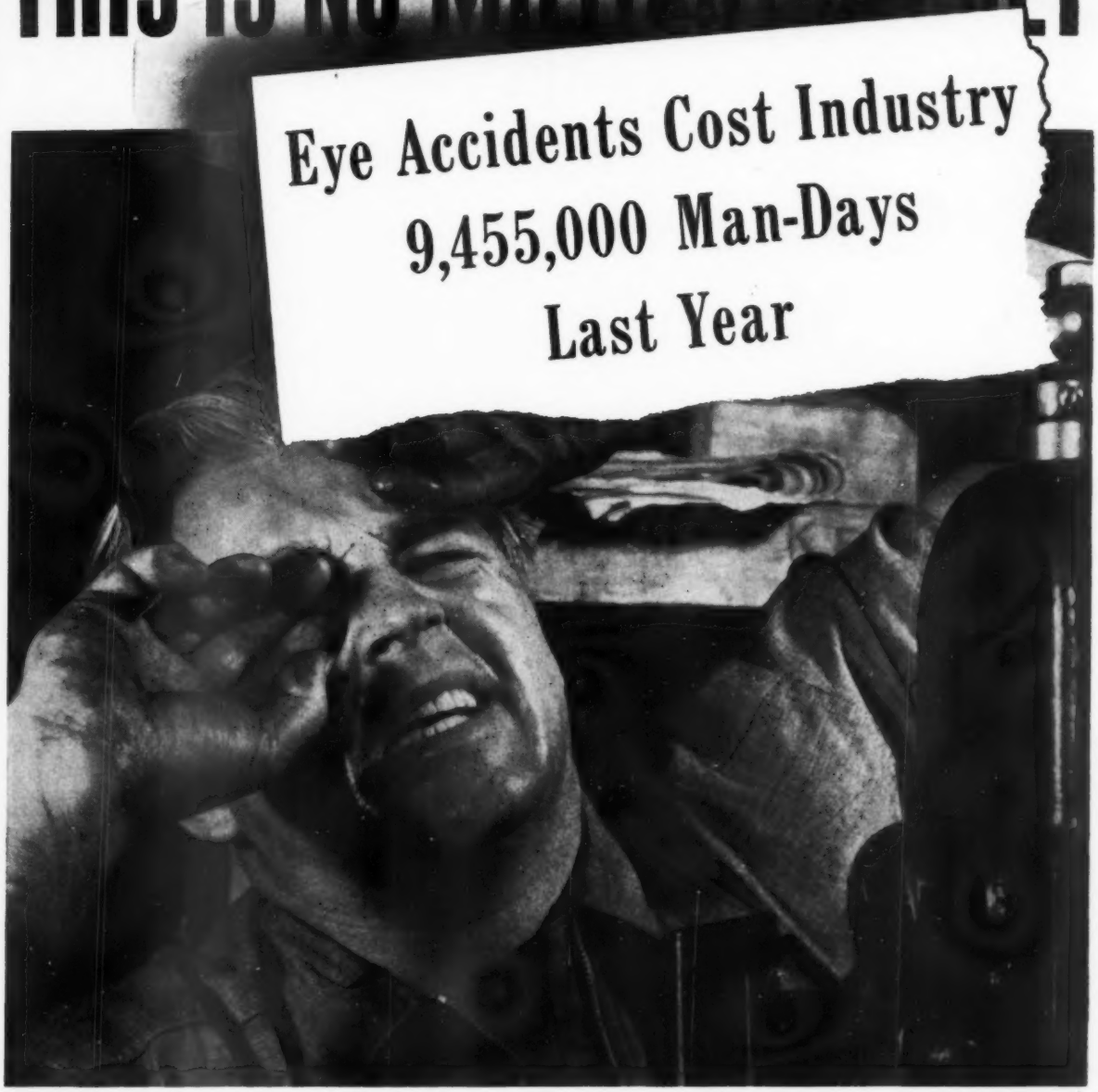

The tremendous number of eye accidents that are slowing up our vital war production are also robbing America of the invaluable services of much skilled labor.

American Optical Company offers the means of minimizing eye injuries—a complete line of protective, comfortable goggles, for every type of industrial eye hazard. More than this, AO trained Safety Engineers will gladly work with *your* Safety Director in every possible way toward installing and maintaining the most effective and economical eye protection program for your plant.

Get in touch with your nearest American Optical Company Branch Office as soon as possible.

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THE TECHNOLOGY REVIEW, March, 1943. Vol. XLV, No. 5. Published monthly from November to July inclusive at 10 Ferry Street, Concord, N. H. Publication date: twenty-seventh of the month preceding date of issue. Annual subscription $3.50; Canadian and foreign subscription $4.00. Entered as second-class matter at the Post Office at Concord, N. H., under the Act of March 3, 1879.

Make CONDENSER *tubes last* MANY YEARS *longer . . .*

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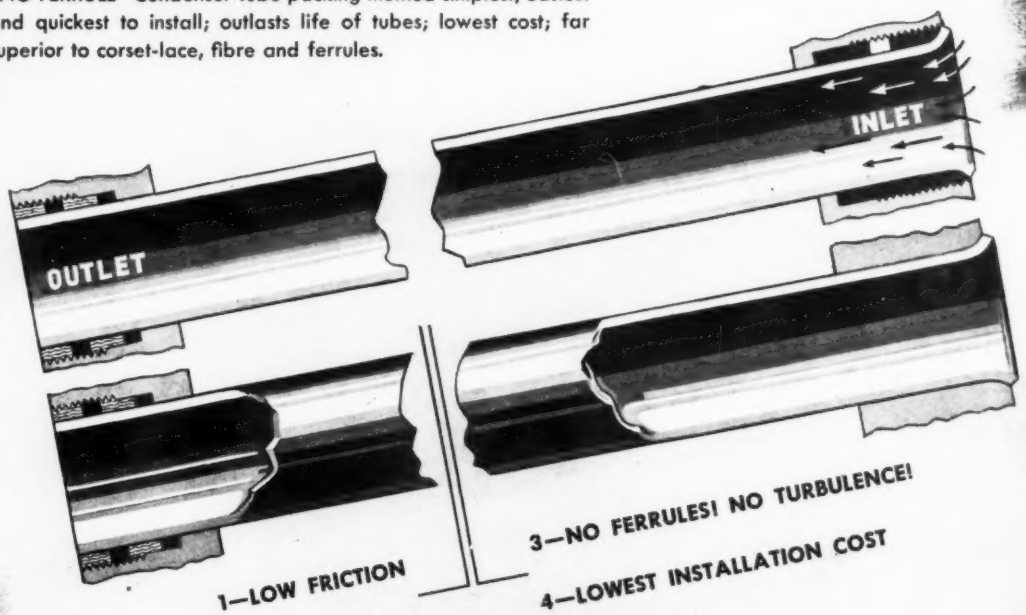
Naval, Marine and Industrial service proves John Crane Metallic "NO FERRULE" Condenser-tube packing method simplest, easiest and quickest to install; outlasts life of tubes; lowest cost; far superior to corset-lace, fibre and ferrules.



JOHN CRANE *Metallic* CONDENSER PACKING

"NO-FERRULE" METHOD FOR NEW AND OLD CONDENSERS

The New John Crane "No Ferrule" method bonds the tube to the tube-sheet in this way:

Illustration top left shows outlet-end of old condenser packed with Metallic and Fibre Expansion Rings. Perfect Bond. Free to expand . . . Inlet-end shows Fibre Expansion Bushing with Lead-slug-insert, bonding tube to tube sheet . . . On new condensers, bottom illustration, inlet-end is packed same as on old units. Outlet-end is belled (no packing). Ask for comparative studies showing advantages of metallic packings over fibre and corset-lace ferrules.

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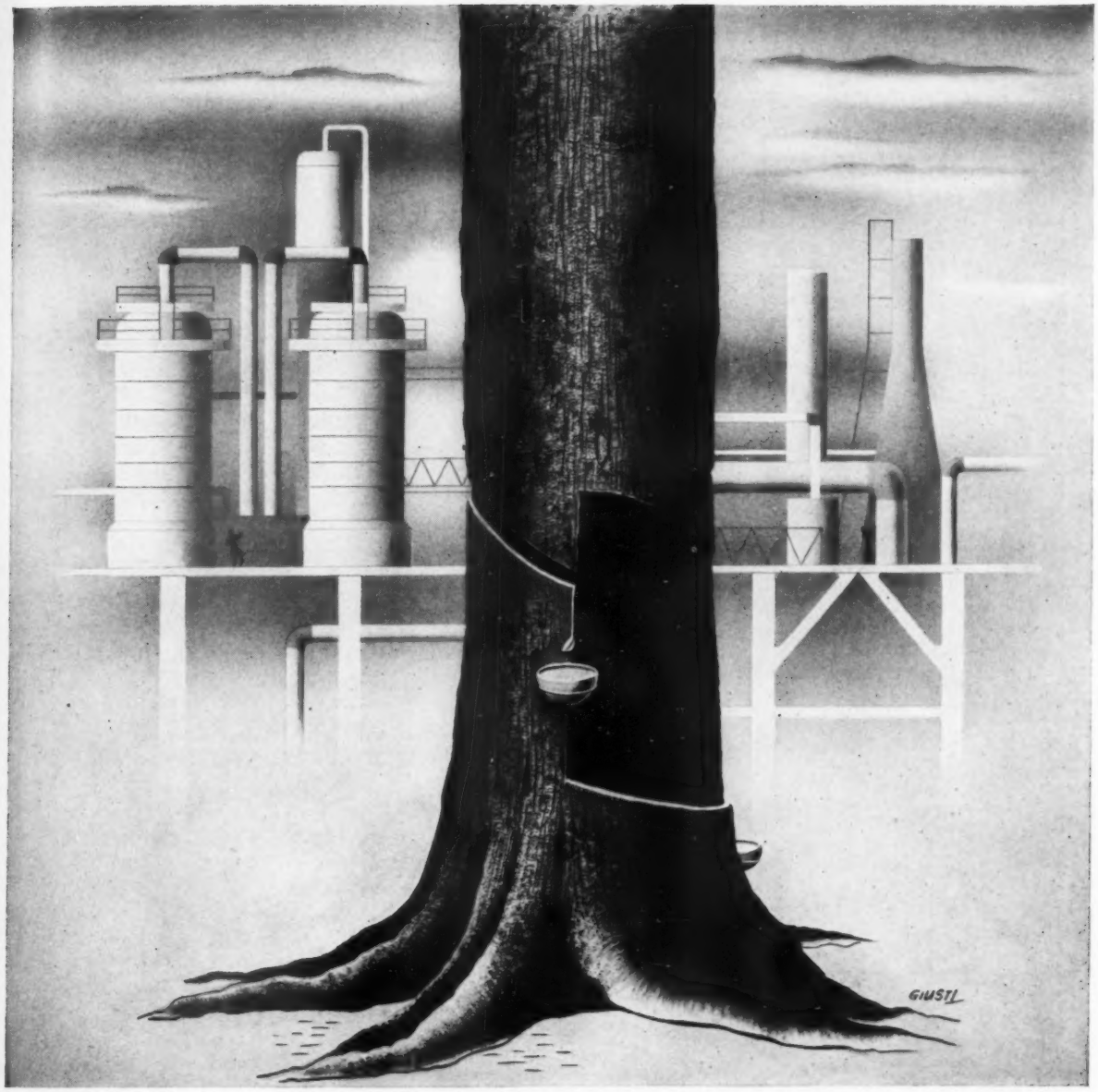

RUBBER TREES are growing in America

This is a lightning war—a struggle of speeding machines and men. You can't fight and work—*fast*—without rubber. Victory rolls on it!

With most of the world's natural rubber in the hands of the treacherous Jap, America's petro-chemical industries must achieve—almost overnight—huge synthetic rubber production.

Badger is helping to do this big, complicated job. It is co-operating directly with the chemical and petroleum industries in the design and construction of a large percentage of the new plants for the production of Butadiene—a primary material in the manufacture of Buna-S, one of the principal synthetic rubbers.

Behind Badger's ability and wholehearted effort to help America solve the critical rubber problem are years of experience in chemical processing, distillation, fractionation and refining.

This experience also enables Badger to do other important war jobs—building plants and equipment for the production of smokeless powder, T.N.T., alcohol, aviation gasoline and many other strategic materials.

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AND SONS COMPANY
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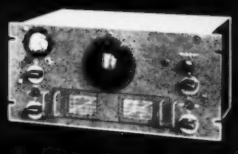


National Radio Equipment, designed for peacetime use, is proving out in the hardest tests of war. Receivers and parts that look familiar to any Ham are coming off our lines in steadily increasing quantities to serve in combat communications. National takes especial pride that war brought no sudden redesign of our products.

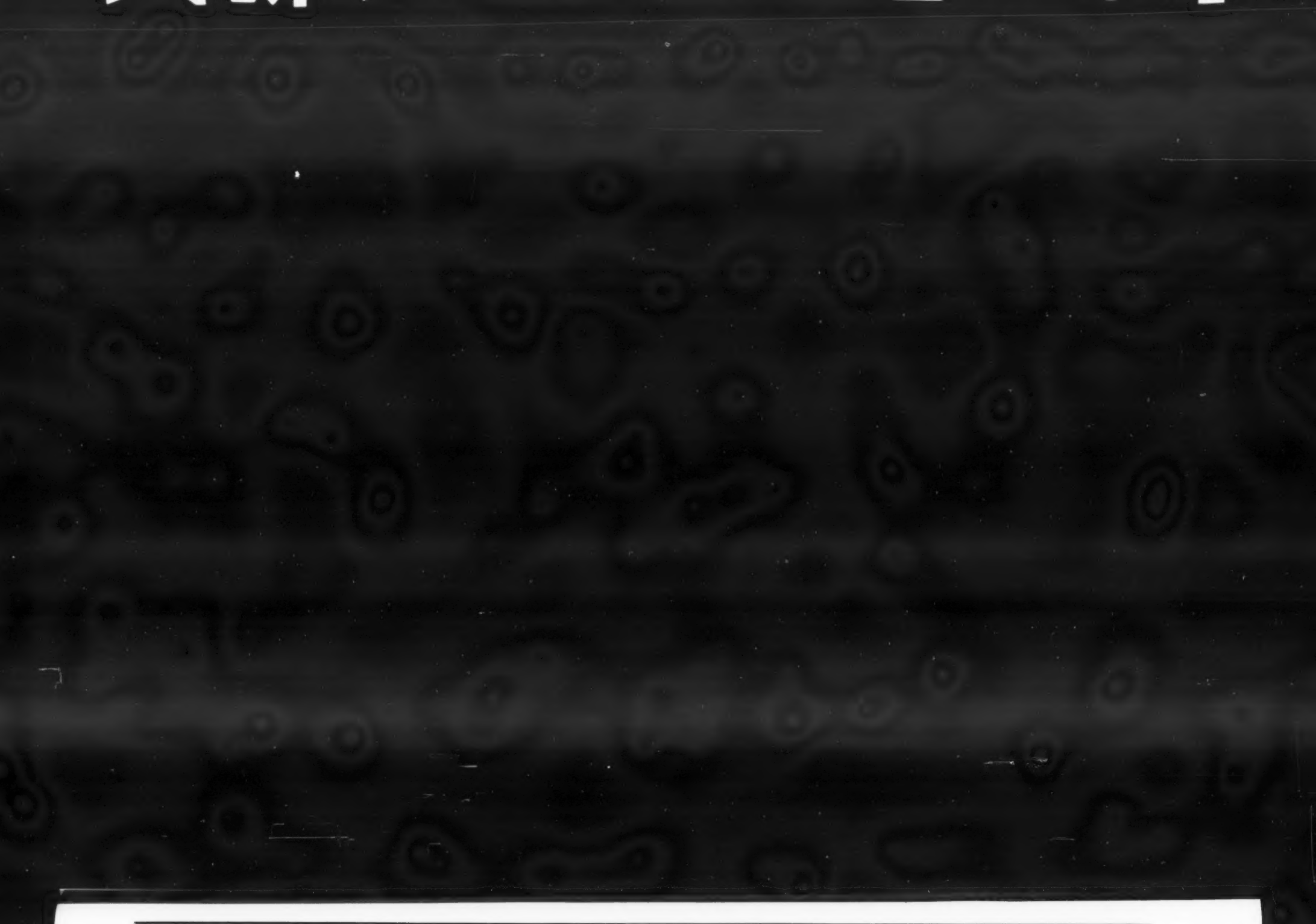
Just as in peacetime, our equipment was tailored to serve the amateur, so now the same basic designs have been modified to meet the specialized needs of United Nations fighting men. As in peacetime, National designs are being steadily improved, but under the pressure of war, years of research and development are being telescoped into months.

There are many technical developments that we wish we could tell you about now. When the war is won, you will be able to see them in the finest equipment National has ever built.

NC

NATIONAL COMPANY, INC., MALDEN, MASS.

OFFICIAL U. S. NAVY PHOTOGRAPH



Wartime readjustments . . . #6

GIL TURNER HAS TO LEAVE HOME TEN MINUTES EARLIER WHEN IT'S HIS DAY TO DRIVE THE CAR POOL

The men in Gil's car pool eat on the run, once a week. But they're better neighbors now, *for having to depend upon each other.*

Many wartime readjustments have their saving side. They make lost luxuries seem less important — and basic values look *larger.*

This war-born insight, applied to the family budget, puts taxes and War Bonds first, then life insurance. All three help the war effort (much of your life insurance premium goes into Government bonds). Insurance also provides a lot of family protection for the modest price you pay.

Life insurance in this company, like the car pool, is a *mutual* proposition. But here you share your risks with a nation-wide group, instead of a neighborhood. And your insurance has a *guaranteed* value that grows steadily, year by year.

Uncertainty need not keep you from buying *now,* for the liberal New England Mutual contract even helps carry itself if the going gets tough!

New England Mutual contracts meet present-day needs because:

1 **DIVIDENDS** begin at the end of the *first* year.

2 **CASH VALUES** begin at the end of the *second* year.

3 **A PREMIUM LOAN** is available beginning with the *second* annual premium.

Let a Career Underwriter show you how valuable these features can be

New England Mutual
Life Insurance Company of Boston

George Willard Smith, President Agencies in Principal Cities Coast to Coast

The First Mutual Life Insurance Company Chartered in America—1835

Pool Insurance Problems, too!

Like the car pool, life insurance is a *mutual* matter. And so is life insurance counsel.

Sound counsel calls for mutual trust and confidence. A good way to get good advice on your wartime financial readjustments is to talk them over fully and frankly with competent underwriters.

A number of them are listed below. They're alumni of your college and they talk your language. They are also trained representatives of the First Mutual Life Insurance Company Chartered in America.

Out of their experience you'll get *practical,* constructive suggestions. They'll help you make the most of your limited life insurance dollars — help you protect your present policies with premium loans if necessary. Check your protection *now when you need it most.*

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If none of these folks is near you, you can get similar service at the New England Mutual office in your city. Or use the coupon below, and the Home Office will be glad to have a competent representative get in touch with you. No obligation, of course.

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This is a Short, Short Story about Long Experience

It has to do with *America's First* in Diesel engines. Forty-five years ago the founders of Busch-Sulzer built and put into operation America's first Diesel engine. It was an immediate success.

Success didn't stand idle. For, out of that early introduction to more efficient engine operation has come a wealth of other successes . . . improvements constantly advanced through the years by Busch-Sulzer.

Today when you look at a modern Busch-Sulzer Diesel, you know you've got something; simplicity of design, rugged construction . . . *assured performance.* You know that you are off to a good start . . . with long years of dependable service ahead—with operating and maintenance costs remaining at lowest levels.

The reason? . . EXPERIENCE.

In the rebuilding that will begin with final victory, Busch-Sulzer Diesels will play their part faithfully. Meanwhile, all of our facilities are devoted to 24-hour production of equipment for the Navy and for orders of high priority only.

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AMERICA'S OLDEST BUILDER OF DIESEL ENGINES

There are GRINDLINS *too, as well as* Gremlins

As the fiendish little Gremlins dance on the wings of the airplane, and ride the radio beams,

just so, devilish little Grindlins tease and hamper the precision grinding machine operator.

"Your wheel is too soft, buddy," gleefully chirps the Grindlin. "Too soft, nix," says the voice of experience. "I true it more frequently because it has worn down to a smaller diameter."

"Ah, I've made your wheel glaze," he taunts. "True enough, you young imp" is the retort, "but I'll just increase the work speed, then watch it cut."

Think this over: Why be heckled by Grindlins while production lags. Norton engineering experience has met up with all their tricks that slow production and impair finish.

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THE TABULAR VIEW

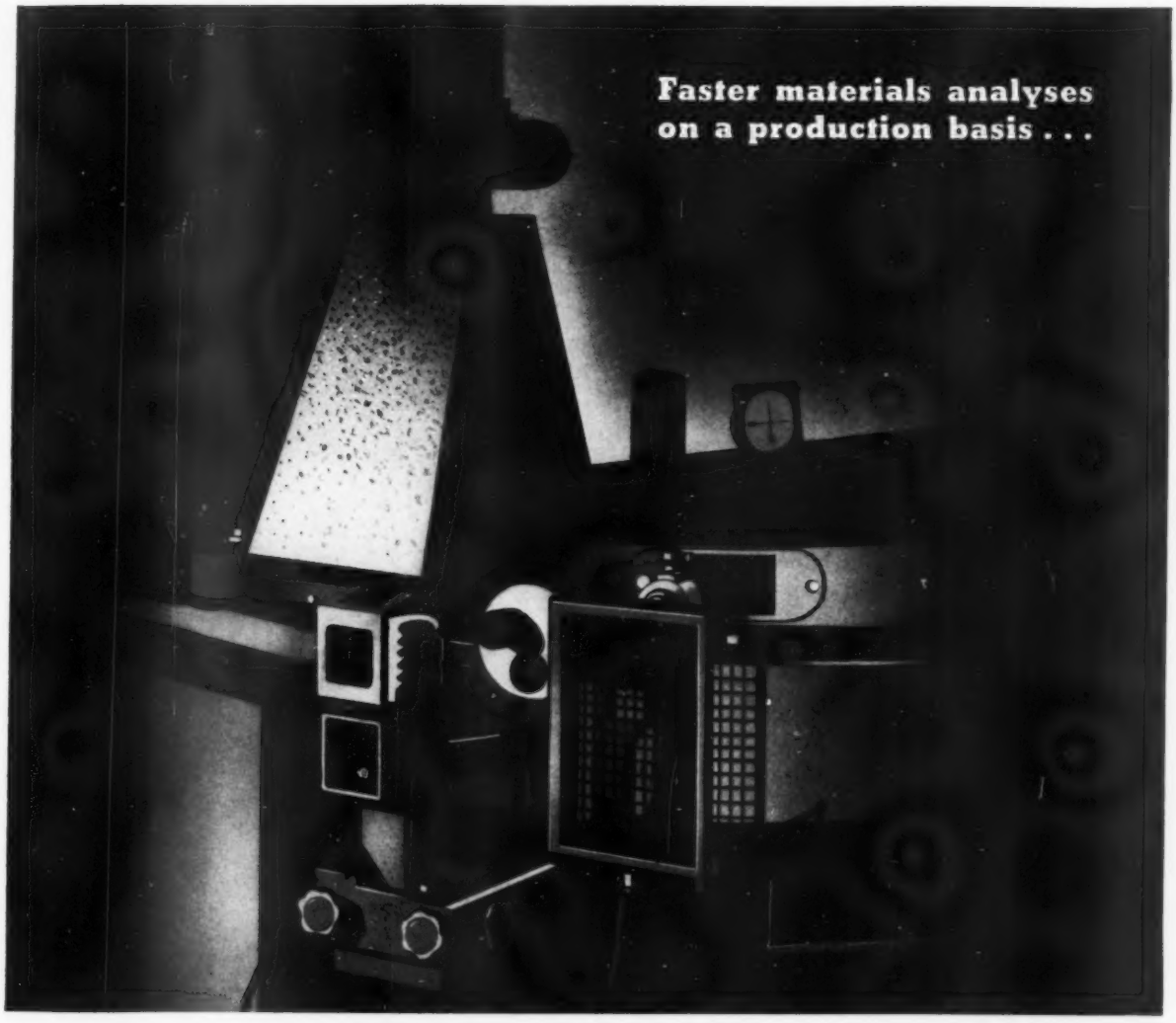
Plenipotentiary. — The commencement address to Technology's Class of 1943, published in this issue of The Review (page 233), was a discussion of the place of trained men in warfare; the speaker knew well whereof he spoke. CLARENCE D. HOWE, '07, who began his professional career on the staff of the Institute, went on to the faculty of Dalhousie University, and later developed the engineering and construction firm which bears his name, was elected to the Canadian Parliament in 1935 and was immediately appointed to the cabinet as minister of railways and canals and also minister of marine. When war demanded, he became minister of munitions and supply. Presenting him at commencement exercises, President Compton characterized this post as "the most important position in Canada under the Prime Minister. In the United States we would recognize its significance if we imagined Donald Nelson, William Jeffers, General Somervell, Harold Ickes, and James Byrnes all combined into one individual."

Godspeed. — PRESIDENT KARL T. COMPTON'S valedictory to graduating seniors each year is an epitome of the attitude toward life and toward education which the Institute expresses. His address this year to the wartime Class of 1943 (page 235) is a powerful assertion of the faith and ideals actuating the advancement of knowledge as Technology seeks to contribute toward it. In the Institute Gazette section of this issue (page 244) are published excerpts from Dr. Compton's annual talk to Alumni, discerning and defining problems all educational institutions must now foresee.

Impact. — Effects of war on the Institute and how the potentialities of the Institute are reckoned on as part of the national effort were discussed in the baccalaureate address this year by PAUL V. MCNUTT, chairman of the War Manpower Commission. Mr. McNutt's address (page 237) surveys the necessities imposed upon technological and scientific schools by war and the ways in which the schools can best meet them.

Futures. — Consideration of possible effects of the continuation of wartime controls into peacetime and appraisal of the virtues and shortcomings of free enterprise as it has operated in the nation's history were the core of the Alumni Banquet address of B. EDWIN HUTCHINSON, '09, Vice-president of the Chrysler Corporation and former President of the Alumni Association. Mr. Hutchinson's forceful paper appears on page 239.

Costs. — What accidents meant to the nation in terms of energy wasted during 1942 is surveyed in this issue (page 230) by EDWARD R. SCHWARZ, '23, Professor of Textile Technology at the Institute and Editorial Associate of The Review. President of the Massachusetts Safety Council, Professor Schwarz has long been active in industrial protection.



Information supplied by Fairchild Engine and Airplane Corporation

Spectograph equipment is now being used by Fairchild for the analysis of materials. Such analyses are necessary to insure that the materials meet the exacting specifications required for highly stressed engine parts. No deviation can be tolerated and constant laboratory control must be maintained. With the spectographic equipment three men can do the amount of work that formerly required thirty.

The operation of the equipment is simple and understandable. Pellets from chips of the material form the electrodes of a high voltage circuit. Current passed through this circuit causes these electrodes to spark brightly. The total color of this spark is separated by a grating device into the wave lengths of the colors present and recorded on film. As each alloying element has a definite color characteristic when burned, analyses of the film for density of wave lengths quickly show the ingredients present and the amount of each.

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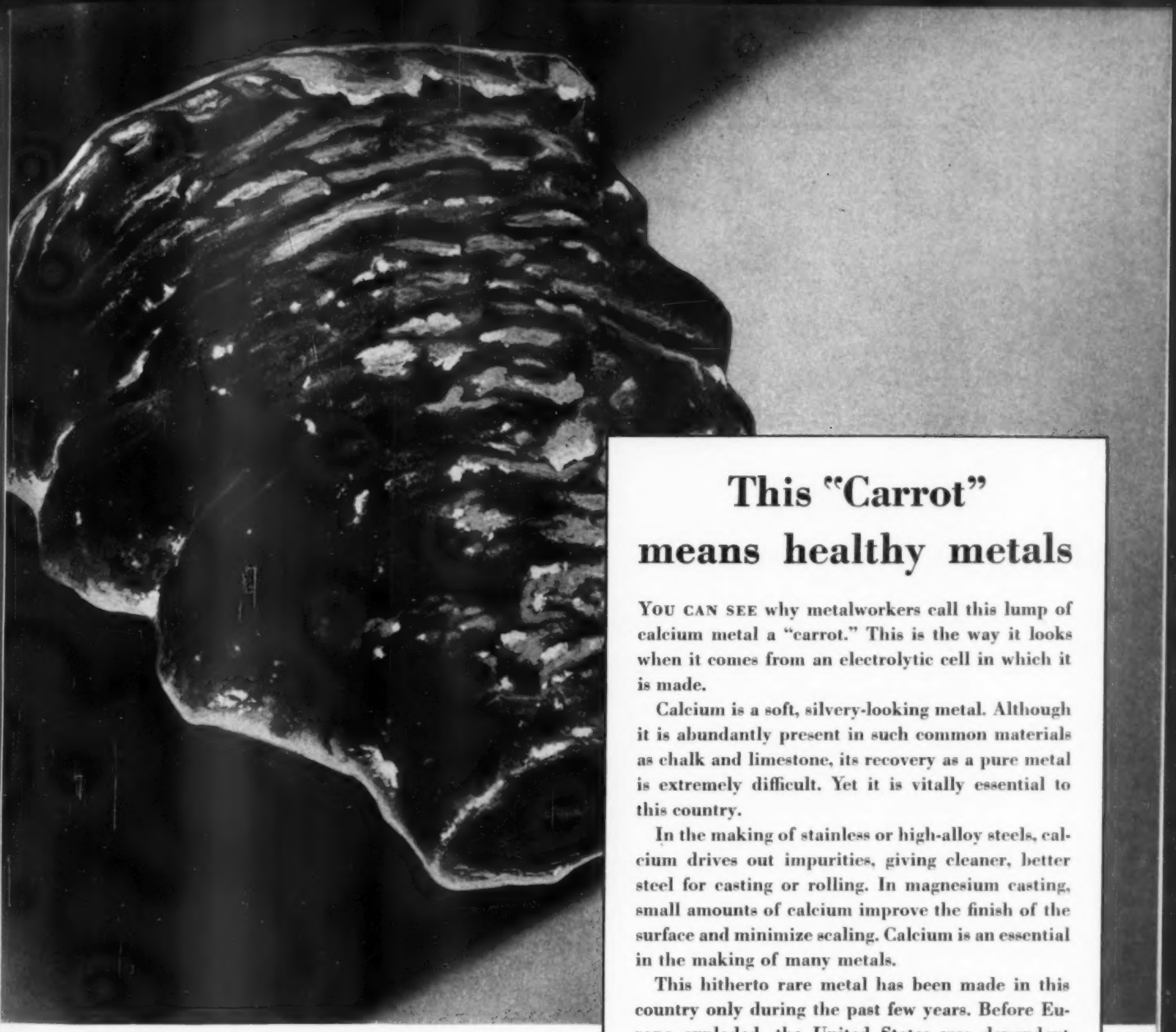


This "Carrot" means healthy metals

YOU CAN SEE why metalworkers call this lump of calcium metal a "carrot." This is the way it looks when it comes from an electrolytic cell in which it is made.

Calcium is a soft, silvery-looking metal. Although it is abundantly present in such common materials as chalk and limestone, its recovery as a pure metal is extremely difficult. Yet it is vitally essential to this country.

In the making of stainless or high-alloy steels, calcium drives out impurities, giving cleaner, better steel for casting or rolling. In magnesium casting, small amounts of calcium improve the finish of the surface and minimize scaling. Calcium is an essential in the making of many metals.

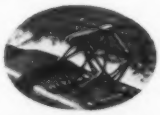
This hitherto rare metal has been made in this country only during the past few years. Before Europe exploded, the United States was dependent upon France as a source of supply.

But back as far as 1935, thinking that this country should have a domestic source, ELECTRO METALLURGICAL COMPANY, a unit of UCC, started a major research program. After four years of work . . . as French supplies dwindled . . . a plant was put into operation for the manufacture of the gray metal. Today, ELECTRO METALLURGICAL COMPANY produces many times as much calcium metal as this country ever imported . . . and production is increasing.

IN THE AIR SOONER! Vital aircraft parts flow from production lines quicker because the use of calcium metal results in better metal.

BETTER HEALTH! Pure calcium metal is used as a drying and purifying agent in the manufacture of certain new disease-fighting drugs.

CHEMICAL HELPER! Calcium is necessary in making a number of rare metals—many of which heretofore were unavailable commercially—and all of which are vital.



METAL-SAVER! In the melting of copper scrap for use in certain types of electrical equipment, calcium is used as a purifier and a restorer of electrical conductivity.

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30 East 42nd Street — New York, N. Y.

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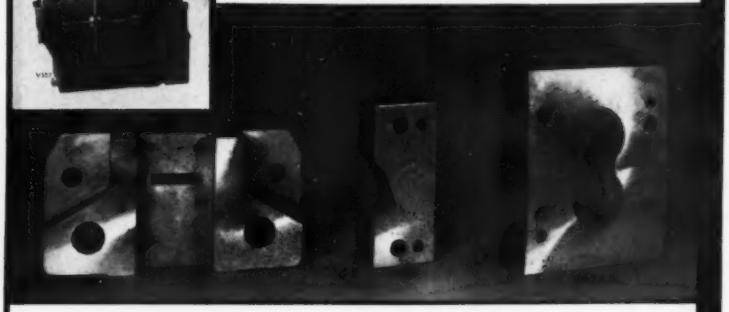
Dies sharpened on the Blanchard No. 11 last longer — save you money



Tool makers - Die makers GRIND DIE JOBS LIKE THESE ON THE BLANCHARD No. 11

The cylinder wheel covers the entire surface at every revolution of the work. High work speed and ample supply of coolant eliminate any danger of heating the work. The Blanchard is a heavy and rigid machine, permitting the economical use of free, soft cutting wheels.

"Excellent — Fast — Accurate" says this customer after more than a year of tool room use.

Savings in time and money, and opportunities to release men from grinding to other work, make it logical to install Blanchard Grinders in every tool and die shop.

The BLANCHARD MACHINE COMPANY

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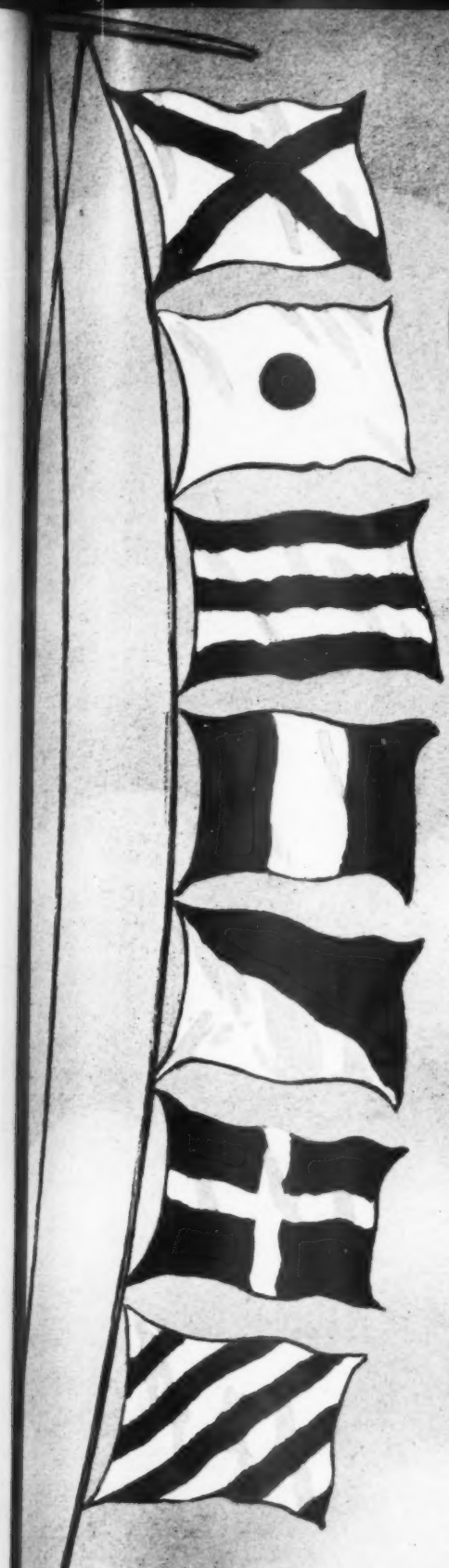

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Courtesy of the Philadelphia Inquirer

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U.S.S. "New Jersey"

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Neapco **employees are proud of their part in supplying Universal Joints for this, the World's largest battle-wagon.**

New England Auto Products Corporation

POTTSTOWN, PENNSYLVANIA

December 1941 — Awarded Navy "E" and Bureau of Ordnance Flag
July 1942 — Awarded Army-Navy "E" with star
December 1942 — Awarded Army-Navy "E" with two stars

D. K. Bullens '09, ***President***

Eyes straining into the dark, spindrift blowing back into his face from a smothered wave, faint-edged with phosphorescence—what thoughts are racing in the back of that vigilant face?

A nostalgic thought, of course, for homes whose warmth envelops him a thousand miles away. A new realization of what industrial, all-out production means in terms of safety and victory.

Yes, but behind it all an equally insistent query he will want answered when he comes home to pick up the old threads of his aspirations.

Let's file our answer now.

It will be a long answer—more production; more bonds purchased; giving up frills and luxuries; and sound, practical post-war plans that can be put to work quickly when he comes home.

Sound planning will include developing and manufacturing new machines—those ingenious, almost human mechanisms that have helped make America strong, free and democratic.

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To save wear on your engine, ask for Sinclair Opaline Motor Oil. Opaline stands up better and lasts longer because it is de-waxed and de-jellied. Have your Sinclair Dealer drain and refill your crankcase with Opaline every 1,000 miles.

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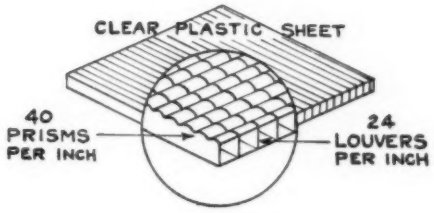
"LOUVERPLAS"

TRADE MARK

THE LIGHT CONTROLLING LOUVERED PLASTIC SHEET

Non-fragile
Light-weight
Cellulose Acetate



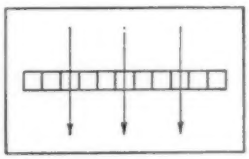
Specifically
Designed for
Fluorescent Lighting

Specify LOUVERPLAS GLARE ZONE SHIELDING

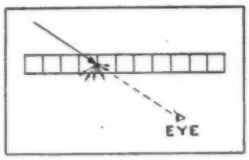
For Eye Comfort and Increased Visual Efficiency Where Seeing Work is of Prime Importance

Used by the Army and Navy

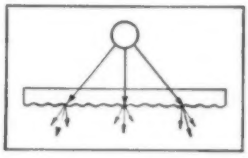
How Louverplas Efficiently Transmits Light and Stops Glare



Sheet is composed of clear plastic alternately spaced with thin white translucent or black opaque plastic louvers. The clear plastic has high transparency for light transmission.



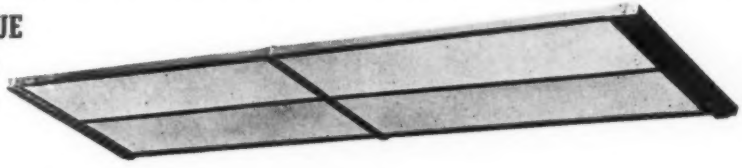
Used as a glare zone shield, the thin white translucent louvers diffuse the light within the glare zone that would otherwise enter the eye as glare. The black opaque louvers will completely obscure the light source from vision. The degree of light control can be varied by the thickness of the sheet.



Prisms are applied to the surface of Louverplas perpendicular to the louvers. The prisms disperse the light source image and control the light in directions parallel with the clear plastic, lowering the surface brightness and eliminating glare.

Louverplas Glare Zone Covers for Industrial Reflectors

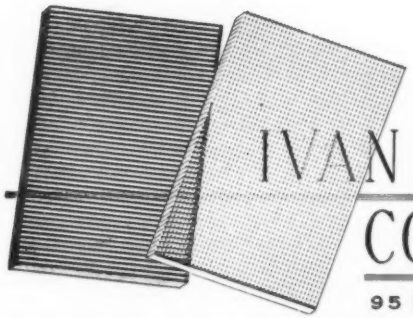
STOP EYE FATIGUE
and Speed Up Production . . .



VISION IS VITAL TO VICTORY

Recommended Louverplas Uses

- **WHITE** — "Glare Zone Covers" for fluorescent lighting fixtures, industrial reflectors and marine fixtures.
- **BLACK** — "Vision Expediting" covers for industrial fluorescent reflectors, for close tolerance manufacturing and inspection of war materials.
- **BLACK** — "Louvered shields" for Cathode-ray Tube devices improving visibility of sine wave.
- **BLACK** — "Dim-out lighting."
- **BLACK or WHITE**—Many other industrial or scientific uses for light control.



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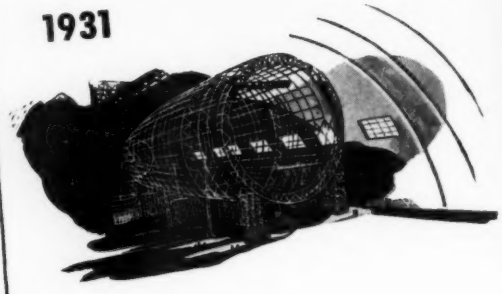
1931



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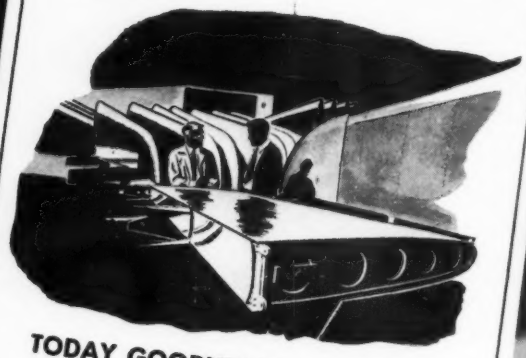
1943



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VOLUME 45 NUMBER 5

THE TECHNOLOGY REVIEW

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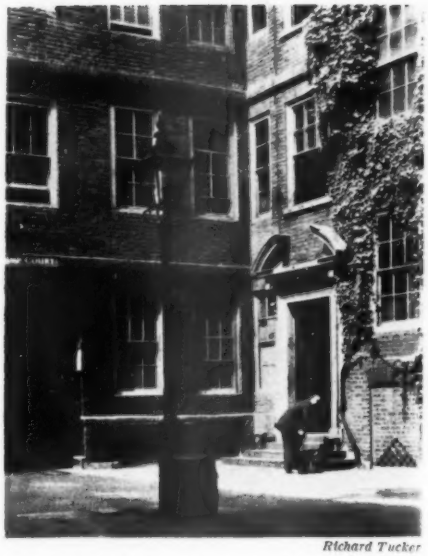
AT THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY



Richard Tucker

A corner of Pump Court in the Middle Temple, before the Germans bombed London

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From a photograph by Andreas Feininger from Black Star

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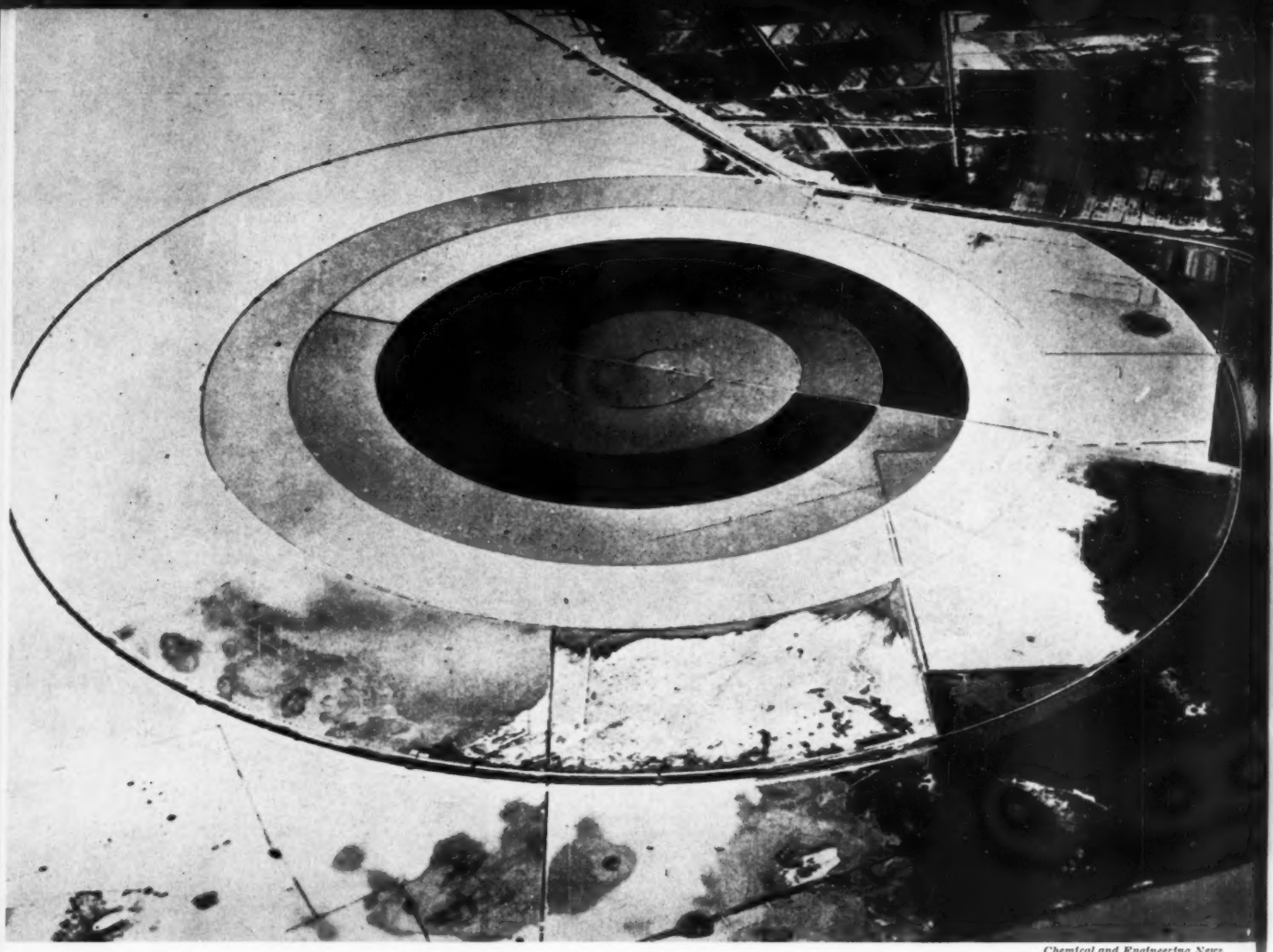


Chemical and Engineering News

The Caracol, *a storage basin for the solar evaporation of salty water drained from land once covered by Lake Texcoco, Mexico City. As described in* Chemical and Engineering News, *the snail-shaped canal, 12 miles in length, has a total evaporation capacity of 10,000,000 tons of water yearly and can produce each year about 100,000 tons of salts, including caustic soda, sodium carbonate, potash, sodium sulphate, and borax, as well as sodium chloride.*

THE
TECHNOLOGY
REVIEW

Vol. 45, No. 5

March, 1943

The Trend of Affairs

Sponge for Scrap?

TWO specters have raised their ugly heads in the American steel situation — one a war visitor, the other looking as if he intended to settle down and stay. The transitory apparition has been created by the clamor for more scrap steel and iron to feed war-hungry furnaces. The supply of scrap cannot respond so flexibly to demand as does ore from the mines, for scrap is essentially a by-product. A considerable quantity accumulates even in the worst of depression years, while no amount of coaxing in periods of all-out production can radically increase the supply. But the steel industry has long been geared to processes which demand about as much low-carbon scrap as they do high-carbon pig iron. Since increasing the ratio of pig to scrap involves some adjustments in technique, a material which would be a direct substitute for scrap would have advantages over an increased supply of pig iron. A possible answer to this problem, according to some commentators, appears to be found in sponge iron.

The more durable-looking ghost is the threat of exhaustion of first-grade iron-ore reserves. In Europe this specter now sits in on board meetings, for except in Sweden and Spain, that subcontinent no longer possesses any important ore bodies assaying about 50 per cent iron, the kind our own industry is accustomed to. That fact is undoubtedly slated for an important role in world history. British and German steel men now smelt 30 per cent ores and find, not surprisingly, that costs are higher. Nor will our own reserves of high-quality ores last forever. Though iron is plentiful in the earth's crust, the same cannot be said for ore deposits of commercial size largely uncontaminated by other substances. Not that entirely satisfactory steel cannot be made from poorer ores. But the processes, if carried out on traditional lines, become increasingly complex. Here also the proponents of sponge iron declare it to offer a more direct solution.

While the sponge-iron process is subject to many variations according to the needs of specific ores or the availability of specific fuels, it is fundamentally the same method used by primitive man at the beginning of the Iron Age and continued until displaced by the blast furnace about 600 years ago. In this process, finely divided ore is heated at rather moderate temperatures in a reducing atmosphere — for example, one rich in hydrogen or carbon monoxide. The oxygen is removed from the iron particles without their being melted, for temperatures are in the order of 1,200 to 1,800 degrees Fahrenheit instead of from 2,700 to 3,000 degrees Fahrenheit or higher as in the blast furnace. Actually reduction of all the iron oxide is difficult, but this fact is not necessarily harmful, for the output of the reducing or roasting furnace can be fed to an open-hearth or electric furnace in which the remaining 10 per cent or so of iron oxide is stripped of its oxygen.

A more difficult problem is presented by the fact that many of the impurities commonly found in iron ore are quite unaffected by the reducing treatment and must be freed from the iron oxide or iron particles before or after this treatment. Sometimes it is almost impossible to grind the ore fine enough so that every particle of iron oxide is dissociated from every particle of the gangue. If purification of the ore is carried out before the reducing furnace, it can be carried out just as easily before the blast furnace, but the sponge-iron process has the following advantage: Since the output of the sponge-iron furnace is still in the form of particles, these can be put through a magnetic separator, the iron particles being kept, the rest being discarded. The powdered iron, which is low in carbon, is then briquetted.

Advocates of sponge iron point to the lower temperatures involved and to the fuel savings per ton of iron which should result therefrom. The process is not dependent on coke, as is the blast furnace, but can use virtually any fuel — natural gas, oil, or a variety of coals. The apparatus required is considerably simpler than that involved in a blast-furnace plant and may permit exploitation of bodies of ore too small to make the erection of a blast furnace profitable. The Bureau of Mines even talks of using spare rotary kilns from the cement and lime industries. Congress has given the Bureau of Mines $600,000 to erect pilot plants and to study methods which can help relieve the scrap shortage or make use of untouched iron-ore deposits (of which many are widely scattered over the United States).

All this is no news to steel men, who have been playing with sponge iron in various parts of the world for many years. Research on a large scale has been privately undertaken and abandoned in this country. A plant with a capacity of 100 tons a day was erected in Japan in 1927. Although it was said to operate satisfactorily using a beach sand containing only 20 to 25 per cent iron and to result in a finished briquette containing 75 per cent iron, it likewise has been reported to be abandoned. Two pilot plants are known to exist in Germany, but that nation, although under the sternest compulsion to make the most effective use of its quite poor ores, has apparently stuck to the more orthodox methods. The attitude of the technical press to the recently revived interest which Washington has shown in this process has ranged from skepticism to sarcasm. When the War Production Board asked an advisory committee from the National Research Council and the National Academy of Sciences for opinion on the process, a distinctly discouraging report was received.

Nevertheless, the W.P.B. has allowed $450,000 to the Republic Steel Corporation for the erection of a sponge-iron plant having a capacity of about 100 tons of iron a day, the iron to go into electric furnaces for the production of high-grade alloy steels. The plant should be ready late in 1943. Generous supplies of a high-grade iron oxide — in this case the by-product of another ore concentration — give this plant unusual advantages. A plant producing sponge iron at an annual rate of 30,000 tons has for many years been in successful operation in Sweden, and for over a year and a half a plant in Pennsylvania has been producing sponge iron for special uses, such as powder metallurgy, which can stand somewhat higher costs for materials.

This evidence becomes less confusing if it is borne in mind that sponge-iron processes can be divided into two general classes — those which start with ores of exceptionally high purity and which use substantially sulphur-free fuels; and those which are intended to utilize low-grade ores, any fuel which is available at low cost, and a minimum of plant. The Republic installation will use a high-grade magnetic ore concentrate with coke oven gas as a fuel; the Pennsylvania sponge-iron plant uses mill scale, which is pure iron oxide, and petroleum coke; and the Swedish plant uses a notoriously excellent ore. Swedish sponge iron for powder metallurgy uses charcoal as a fuel, but most Swedish sponge iron is made with waste gases from coke ovens.

The great opportunities and the great problems, however, are in utilizing low-grade ores. Steelmaking is a game in which this nation can afford to lose no bets. Eventually we shall have nothing but low-grade ores; hence it is well that a thorough exploration of the possibilities of sponge iron is being made.

Old for New

BOOKS mean headaches as well as pleasure, and headaches not only to authors and students but also to production men in a good many callings. Authors in a war-torn world have more subject matter to deal with than they can conveniently handle; production men are finding that they have less of everything than they need. As a consequence, in numerous ways the publishing industry is falling back on techniques and materials which were standard in earlier days and now are being revamped to meet the needs of high-speed production.

Stitching wire — the fine-gauge tinned steel wire used to staple magazines, newspaper supplements, pamphlets, brochures, sales-book continuous forms, and so on — is most efficient when it is most inconspicuous. Readers usually pay no attention to it unless it fails in its task. Last year, 2,500 tons of it were used. This year, it is an increasingly critical material. Hence recourse is being had to paste, to glue, to sewing with thread. If a 16-page booklet, in an edition of 100,000, is not wire stitched, three miles of wire are saved. When paste, glue, or sewing is not feasible, the number of wire stitches is being reduced. Thus the supply is being stretched.

Limitations on steel show up in another department of publishing — the manufacture of loose-leaf binders. In these, wooden covers are cloth covered in standard fashion, wooden clamps replace steel in some versions, plastic binding posts occupy the place of metal in others.

Slaughter on the Home Front

BY EDWARD R. SCHWARZ

A SHUTDOWN of the nation's entire shipbuilding and aircraft industries for 54 days would be featured by the press throughout the world as a major calamity. The time lost by reason of nonfatal injuries to workers in 1942 was equivalent to such a disaster. Add to this the 47,500 deaths of workers by accident and think of the 22,000 heavy bombers that might have been built. The home-front casualty list for what amounts to our first year of the war totaled 93,000 dead and 9,300,000 injured, at a cost of $3,700,000,000.

Among American men in the 22-to-38-year age group, accidents are, in general, the largest single cause of death, and for the entire population they rate fifth place, exceeded only by heart disease, cancer, cerebral hemorrhage, and nephritis. This knowledge must make the Axis powers rejoice; the accident death loss is equivalent to more than tenfold the lost time due to industrial strikes. One of the best allies of the Axis powers is our carelessness. Nor is it confined to industry, where about one plant in eight has an adequate safety

program. Off-the-job accidents caused 2,350,000 nonfatal injuries and 29,000 fatalities. The man power lost as a result of these accidents might have supplied us with two score battleships, several hundred destroyers, more than 10,000 Flying Fortresses, or nearly 200,000 light tanks.

The automobile continues as a leading cause of accidents resulting in death, with a toll for 1942 of 27,800 fatalities. We have created a weapon which in time of peace as well as war is taking a worker's life every 45 minutes of working time. Even with reduction in the number of cars on the road and the present conditions of rubber and gasoline rationing, the dimout is causing added hazard for those who walk and drive. The automobile driver is truly the modern juggernaut.

In spite of man's pride in his ability to walk erect, with the resultant freeing of his hands for the exercise of marvelous manual dexterity, he is not too efficient, since falls account for the second largest number of accident fatalities. More than 10,000 persons a year are killed by falls in their own homes; many more are painfully injured. For instance, not so long ago a large insurance company reported that a man, taking off his pajamas to get dressed, stubbed his toe in the process and banged his knee against a dressing-table bench. The pajamas fell down around his ankles, tripping him once again, and in the resulting fall he seriously sprained his wrist. The comic-strip banana peel could do no better and is typical only of how funny (and how tragic) our failure to maintain our uncertain equilibrium can be.

Too often we fall from the frying pan into the fire — for burns are third in the general list of accident causes, rating second in frequency as a cause of death in the home and accounting for over 8,000 deaths. Public benefactor in an imposing way is the common match, but in Jekyll-and-Hyde fashion it is also Public Enemy Number One. In how many conflagrations does its tiny glow flare fearsomely! Careless use of matches is one of our worse crimes against public safety.

From one extreme to another is no jump at all in accident causation. Next to fire as a cause of accidents is water. We seem to try to drown those whom we do not burn. At least, we kill more than 6,000 a year that way. Not content with these normal activities, we shoot several thousand more and fatally poison about as many. In the 15-to-24-year age group it is interesting that firearms are the largest single cause of accidents and third largest in the 5-to-14 age group. As with the motorcar, refusal by the individual to assume the responsibility that automatically goes with the possession of such a dangerous weapon results in injury and death not only to the heedless user but often to the innocent bystander as well. We pride ourselves as a nation on our efficient mechanization both for war and for peace, but in the vital matter of fire fighting we allow our municipal fire departments to struggle along with antiquated apparatus. A recent survey by the National Fire Protection Association shows that in 365 cities of more than 20,000 population, 52 per cent of the pumpers and ladder trucks are over 15 years old and half of them are over 20 years of age. In 38 such cities, no pumpers in service are less than 16 years old. What can happen in such circumstances is illustrated in a fire in one of our New England mill cities, where three pieces of apparatus broke down and went out of service during the blaze. That this fire occurred on December 7, 1941, simply indicates that on the eve of our biggest war we were fighting on the fire front with too little; because of shortages of critical materials, it is now too late.

The whole situation is a challenge to our educational system. From the kindergarten to the graduate school of science and engineering, we should be stressing over and over again the individual's responsibility for his own and his neighbor's safety. Until our program of instruction supersedes ignorance with knowledge and instills an abiding sense of care and responsibility, the slaughter will continue. A safety program by industry can be only partially effective in its major aspects, even though it functions with amazing efficiency in the plant and succeeds in some measure in carrying over to the

Acme

Herald Square in New York City, opened up to the camera by demolition of the Sixth Avenue elevated railway, illustrates still how accidents happen.

Rosas from Three Lions

Efficiency and adaptation as expressed in part of Costa Rica's transportation industry. The small dugout is held in place in the larger one by means of a metal catch. The mast of the larger vessel is stepped through an opening in the bottom of the "dinghy." When the traders must separate to supply outlying villages accessible only by rowing up creeks, the mast is unstepped, the hole is plugged, the little boat goes overside, and one man rows away in it while his mates, restepping their mast, get under way again.

worker's home and his off-duty pursuits. Recently a motion-picture study of the daily activities of workers in a large Massachusetts industry was made in order to demonstrate strikingly and convincingly how a real safety program operates in industry. The task was being most satisfactorily completed when the final scene, showing the workers leaving the plant at the end of the day, was photographed. This scene had to be entirely deleted because nearly every unsafe practice imaginable under these conditions was committed as soon as the whistle blew. While American industry during the last few years has reduced lost-time injuries by two-thirds in frequency and has halved the severity of the remaining third, off-the-job accidents were gaining in frequency and severity, with more than half of all accidents occurring in homes.

To fight for the safety of our loved ones in a bitter World War avails us little when our home-front casualties far exceed our battle losses and when this crippling of the home front makes the war effort just that much less effective. Our second front is manned by the man behind the man behind the gun. We can keep him alive if we will!

The Carolina Bays

THE curious craters which pock the Atlantic coastal plain in North and South Carolina, first discussed nearly 60 years ago, came back into the news in grand style in the early 1930's, revival of interest in them being a result of aerial photography. The airplane and the camera permitted an over-all view of the mysterious depressions, showing hundreds of them in areas where usual topographic mapping had discerned only one or two. Studying the photographs, geologists soon sought theories to explain the origin of the oval craters, which are bordered by rims of sand thickest usually near the southeastern ends and which lie with their long axes significantly parallel and running northwest-southeast. Bombardment of the earth by an enormous shower of meteorites which struck at an angle from the northwest received great notice as a possible explanation of the depressions.

Describing the bays, sketching scientific studies of them, discussing various hypotheses assigning to them a terrestrial origin, and analyzing at length the hypothesis that they are meteorite scars, Douglas Johnson, professor of geology at Columbia University and onetime assistant professor of geology at M.I.T., advances a hypothesis of complex origin.* The central problem, he explains, is to account for the form and orientation of the bays, that is, for the fact that they are oval rather than circular craters and that their major axes are generally more or less nearly parallel in any given locality, trending almost always between south and east. The hypothesis of complex origin, summarily stated, supposes that "artesian springs, rising through moving groundwater and operating in part by solution, produced broad shallow basins occupied by lakes, about the margins of which beach ridges were formed by wave action and dune ridges by wind action."

Explanation and exploration of the application of this hypothesis constitute seven chapters of Professor Johnson's book. Quite apart from its scientific significance, the volume is of marked interest as an example of able and thoroughgoing analysis of a baffling and fascinating question; as an illustration of how the development of a new device — in this case, the airplane — may give new strength to an ancient science; and as an engaging discussion of a topic that is engrossing if only because man can do nothing about it. (*Concluded on page 286*)

* *The Origin of the Carolina Bays* (New York: Columbia University Press, Columbia Geomorphic Studies, No. 4, 1942). xiii + 341 pages. $4.50.

Engineers in Wartime

Shortage of Technically Trained Men Greatest Problem Posed by War

By Clarence D. Howe

COMMENCEMENT ADDRESS TO THE CLASS OF 1943

A DEGREE from the Institute is both a great asset and a real responsibility. In the more than 35 years that have elapsed since I received my own degree, I have practiced my profession in several parts of the world. Wherever I have been, it has been my experience that a degree from Technology is accepted both as a certificate of competence and as a guarantee of integrity. The responsibility will be yours to see that nothing you may do will in any way lessen the prestige which attaches to a degree from the M.I.T.

You are leaving the Institute at a time when your welcome either into the armed services or into industry can be guaranteed. I know of many acute shortages, such as shortages of steel, rubber, petroleum, nickel, and copper, but no shortage is so acute as that of technically trained young men. Those of you who are physically fit have entered, or probably will enter, the armed services, in the activities of which your technical training can and will be used to the full. This is a mechanical war, and the problems of operation, maintenance, and supply rival in magnitude the most difficult engineering problems of all time. Modern science applied to war production has brought forth instruments of war that can be operated successfully only by those having an engineering training. In many circumstances, my experience has been that machines can be produced more rapidly than expert operators for those machines can be trained. Young engineers absorb training quickly. Though for other professions service in the Army and Navy may mean lost time in advancement in a specialized calling, this situation is not true of engineering. Those of you who return from the war will have obtained professional background such as can hardly be duplicated in any peacetime careers. You will not only have served your country in its hour of need but you will have had invaluable experience within the scope of your chosen professions.

No doubt many of you, for reasons of physical condition or specialized training, will find your places in war research or war industry. If so, you will enter an industrial activity moving at a higher tempo than ever before in history. Research is being rushed forward in every direction. Application of research is being carried on at a pace that would be considered reckless were it not for the urgency of wartime demands. In ordinary times, a new development moves from the laboratory to a pilot plant, where the process is proved from the point of view of production before going into full-scale manufacture. Under the pressure of war needs, the pilot plant is being eliminated, and we are going from the laboratory direct to full-scale application. Under the lash of necessity, developments which in normal times would take years are being compressed into months. The story of the contribution of science toward the winning of the war cannot, for military reasons, be told at this time. But when it is told, the place of the scientist will be second to none in the march toward victory.

By far the majority of wartime inventions have a peacetime application, and the postwar world will reap these fruits of war in the form of new industries and new improvements in our standard of living. Those of us who are concentrating on war production are hardly in a position to predict industrial developments of the postwar period, but certain probabilities are obvious. For example, aluminum and magnesium will be obtainable in tremendous volume at probably half their pre-war cost. Rapid strides are being made in the manufacture and use of plastics, and many new chemical war plants can be converted readily to that industry. Synthetic rubber that can be specially made for special purposes will be available, as will abundant quantities of high-octane gasoline. The combination of these factors certainly indicates radical new designs for the postwar automobile.

More spectacular still will be developments in aviation. Since the war began, transatlantic and transpacific aviation has become a commonplace. Radio detection instruments developed for war purposes will, when applied to air transport, probably remove present disabilities arising from weather and fog conditions. The pressure cabin, now being used in fighter aircraft for high-altitude work, will be incorporated in transport planes, enabling flights at high altitude without discomfort to passengers. A tremendous expansion in transportation by air is a certainty.

Those familiar with the scientific advances now being applied to modern warfare can foresee many types of development quite as spectacular as the two I have mentioned and equally important to postwar living. I cannot be at all pessimistic about the task of postwar reconstruction. I wish only that I could have your opportunity to take an active part in rebuilding the postwar world. I am sure that you will build a better world than the one we have known, a world in which peace and freedom will be the heritage of all and in which aggression and domination will have no part.

Some eight years ago I was elected to the Parliament of Canada and became a member of the Canadian Government. For reasons that I cannot understand, the entry of a professional engineer into the work of government is unusual; in fact, I believe that I am the second engineer in the British Empire to become a member of a

government. I have found that the training and experience of an engineer are useful in the work of government in these modern days when governments are very much involved with business problems. I suggest to you that should an opportunity come to enter public life, you think twice before refusing. In that field the problems related to engineering are likely to grow in number and complexity as the years go by. Probably because of my engineering training I was assigned, when war came, to a new ministry charged with the procurement of munitions and supplies for the armed services and with the organization of industry for full-out war production. Most Allied countries have found it desirable to call on civilians like myself to assist in procurement problems. In England, procurement for the army is in the hands of a civilian ministry of supply; that of airplanes is the responsibility of a civilian ministry of aircraft production; while that for the navy is the responsibility of the navy itself. In the United States, the organization of industry is a civilian undertaking, while procurement for the Army and Navy is the responsibility of the Army and Navy, with certain civilian assistance. In Canada, the Department of Munitions and Supply handles procurement for the army, navy, and air force and for all Allied governments, as a civilian task.

The mobilization of industry for war is a drastic and revolutionary operation. Great industries must be told to stop making their usual products and tool up for wholly new work, perhaps in a widely different field. New machine tools must be provided in tremendous quantity; in fact, the machine-tool industry governs the speed of change-over and must itself be expanded, as the first necessity. Plant extensions and new industrial plants must be designed and built. Management must be expanded to operate the augmented facilities, for a shortage of trained management is one of the major problems in the initial stages. Men and women who have never before worked in a factory must be trained as mechanics and machine operators. All these things go on while the expanding army, navy, and air force are pressing for weapons for new recruits. Industry is attempting to produce new products for which complete plans and specifications usually are not available, with the result that it must feel its way in working out time studies for the various component parts.

In these circumstances, confusion and lack of coordination inevitably become for a time the order of the day. Production of components gets out of step; distribution of raw materials breaks down; certain machine tools fail to come forward when required. I think it has been the experience of all Allied countries that the first months of war production have shown disappointing results.

As each breakdown in the production machinery occurs, it indicates its own solution. Gradually an efficient top organization is evolved, capable of bringing order out of chaos. To insure adequate raw materials and proper distribution of them, controllers are placed in charge of basic industries, with dictatorial powers to straighten out the industry for which each is responsible. Thus, production and distribution of steel become the responsibility of one controller, while others take charge of such industries as nonferrous metals, machine tools, petroleum products, rubber, lumber, and any other which may hamper the war effort because of shortage in its output or inequality in distribution of that output. It becomes the duty of each of these controllers to mobilize his particular industry for war, to organize maximum production, to correct inequitable distribution, and to reduce nonwar consumption to a minimum. A system of priorities must be set up to provide that urgent war production, in the order of its relative importance, has the preference in obtaining raw materials and industrial capacity. Through the efforts of the controllers, each operating in a separate field, industry can be provided with its necessities, and the output of weapons, ships, and aircraft can be brought to the maximum. Over the controllers and priority officers must be coordinating officers, and over all must be a directing head, clothed with ample authority to make far-reaching decisions.

Interestingly enough, the war organizations of all Allied countries, though differing in detail, follow the same broad pattern. All have organized, or are organizing, their industrial capacities for full-out production on a scale far beyond anything that could have been anticipated in pre-war years. Today the Allies are outproducing the enemy countries by a wide margin, in spite of the five years' start of the enemy countries. Each month shows a wider gain in production for the Allies. The initial equipment for our armies has been provided already or is easily within the productive capacity of present-day industry. For ships and aircraft the demands are beyond the present supply and will be for a long time, but this situation is no longer true of a very wide range of ground-war weapons.

The actual buying of war equipment and supplies in a period of great industrial activity presents unusual problems. In ordinary times, the customary and sound system is to call for tenders and place the business with the lowest tenderer, consistent with satisfactory workmanship and the desired time of delivery. In the purchase and sale of new war weapons, neither the buyer nor the seller knows what the cost will be, with the result that competitive quotations are likely to be higher than are necessary. Purchase by tender continues to be the best method of buying ordinary supplies, but for new and unusual types of manufacture other methods must be resorted to. Our two governments have a common view that no large profits must arise out of war production. This is fundamental in present-day war purchasing. We must keep in mind, however, that profits are only a small proportion of the total cost and that the contract must also provide an incentive for rapid and low-cost manufacture.

As a means of controlling costs and profits, government purchasing agencies are clothed with wide authority to audit the books of any manufacturer and to renegotiate contracts at will. It is the common experience that as large plants swing into full production, costs of war materials tend to drop sharply. The government, therefore, takes power to renegotiate prices whenever an audit shows profits to be above the scale that has been established as fair and reasonable. In other words, the problem is to use the profit motive as an incentive to rapid and low-cost production (*Continued on page 252*)

Toward the Mountain

An America at Peace in Years to Come Is a Goal Accessible to Skill and Courage

By Karl T. Compton

VALEDICTORY ADDRESS TO THE CLASS OF 1943

LAST year's Class was graduated a month early, experiencing only minor modifications of program on account of war conditions. You are being graduated a full term ahead of normal schedule. From now till victory is won, the Institute must proceed at a fully accelerated pace, with classes scheduled clear around the calendar. You are therefore the last class for the duration of the war to have the privilege of education at Technology under substantially normal conditions for the major portion of your course.

While the Institute will continue to maintain its traditional high standards for its academic degrees, the first priority in its educational activities is now given to its co-operation with the Army, the Navy, and the War Manpower Commission in their tremendous programs for training the youth of these United States to serve their country in the most effective manner within their power. Fortunately for us, the type and fields of education to which our institution is dedicated coincide to a remarkable degree with the educational needs officially announced as most urgent in this war effort. Hence no changes in point of view or objectives will be required of us, but only changes in schedules and somewhat more concentrated emphasis on things most practical. This statement is true for those students who will be permitted to continue toward partial or full completion of requirements for our academic degrees. In a much exaggerated form it is also true for those students who may be detailed to us by the Army or Navy, not as candidates for degrees but for special training along technical lines of great importance in prosecuting the war. Even they will be securing their education along the same basic lines for which they might have come to us in peacetime.

In a world whose normal economic and social processes are upset, as at present, the significance of graduation is apt to be disclosed in a somewhat distorted fashion. In fact, this has been the subject of various attempts at humor. A man who was associated with me on the Baruch Rubber Committee sent me a cartoon apropos of today's ceremony. It shows a college president — stoop shouldered, bald, and bespectacled, in the most notorious collegiate fashion — presenting a diploma to an earnest but rather dumb-looking senior with these words: "You're getting off to a good start in life — your diploma has a rubber band around it." Owing to the rubber shortage, we have refrained from presenting each one of you with a fat rubber band as our final effort to enhance the value of the educational program from which you have just been graduated. But we do believe, with the statement in the cartoon, that "You're getting off to a good start in life."

I might give a number of arguments to back up this statement, some based on the relation of your training to the immediate necessities of the war and others based on more far-reaching considerations. I should like, however, to concentrate on just one aspect of the situation, which I know to be troubling many young graduates at this time. Some of them feel bewildered and discouraged. They have been working hard to secure a training which will be the basis of a hoped-for useful and happy career, and now they see this career buried in the debris of the world upheaval.

Such feelings as these are in themselves no disgrace: They are more likely to come to persons who have clear and intense objectives in life than to persons whose careers are as yet undirected. They are more likely to come to students in a professional school than to other types of students, whose careers are not yet directed and who therefore can be more easily diverted to the unexpected requirements of a new situation. The professional-school graduate may wonder, "What's the use? Through no fault of mine, I've been let down." I hope that what I have to say will be of help to any who have thoughts or worries in this direction.

"For advancement and development"—the Rogers rotunda

Paul J. Woolf

Let me therefore direct your thoughts toward the future, as is proper at a ceremony named "commencement." Looking to the future is a characteristic of youth and vigor. When a man begins to think more of the past than of the future, it is a sign that he is a has-been. When a man's thoughts are mostly directed into the past, his career, as Charles F. Kettering has remarked, is likely to be like that of a man driving an automobile while facing backward — he doesn't get very far, and he usually gets into trouble. While a person may find some comfort in thinking about past associations and experiences or may profit by analyzing the reasons for past mistakes, and while all his past is the foundation on which his future must be built, only the possibilities of the future give any significance to his further existence.

There are, however, several ways of looking ahead. One is simple curiosity; this is a sign of intelligence. Another is worry; this indicates weakness and lack of decision. Still another is planning; this, if combined with effort to carry out the plans, is the way to meet the future with a good chance of success. All of you are curious about what the future may hold in store for you; probably all of you have periods of worry; and all of you have more or less definite plans and hopes for the future. I hope that what I see ahead may be true and that a look at it may help you to reach it.

I see in the distance an America which is at peace; an America in which men and women are working at creative tasks with confidence and enthusiasm; in which free enterprise is still strong, though tempered with a higher degree of social responsibility and interdependence than formerly. In it will be joined more skillfully than before two great social principles: "the freedom of the individual" and "the greatest good for the greatest number." Useful public-works projects will be carried out on a large scale to improve the comfort and efficiency of our communities. Old and new industries will hum to fill the deficiencies accumulated during the war, and to produce new and improved devices of great variety. Scientific research and engineering development will make a great surge forward as the energies which have been diverted to war efforts are released again to follow their normal creative channels. Meanwhile the standards of living, both cultural and material, will rise to new heights for all the people. These things will not happen in the United States alone, for centuries of experience have taught us that no one nation can long prosper at the expense of other nations. Our Canadian brothers to the north and our Latin American cousins to the south will share in this forward movement as, less intimately, must more distant peoples as well.

Winter along Charles River Road

John E. Tyler, '40

This vision of the future is like the view of a distant mountain as seen by a party which has set out to reach it or perhaps to climb it. Think of us as that party. From a distance the mountain stands out clear and distinct in its major details. Also clearly visible is the near-by environment, in which we can see the path ahead for a few hundred feet. But in between the near environment and the distant mountain are the foothills, range on range of hills and valleys which lie obscure and mysterious between us and our goal. What particular difficulties we shall have to overcome in this intervening territory we can only surmise in a vague way. We know only that to reach the mountain, we must take the trail ahead and do our best to surmount the difficulties as we encounter them. Some we may be able to circumvent by choosing our course skillfully. Others we shall have to climb the hard way. But we know that the mountain is there, and we know that we can reach it if we have the requisite determination, strength, and resourcefulness.

Like this mountain is our future, as we hope to have it. We know that it is there, if only we as individuals and as a nation have the determination, strength, and resourcefulness to achieve it. Right ahead of us the path we must follow is clearly defined: It is the path toward the winning of the war. Each of us has the first part of this path laid out for us — by Mr. McNutt or Mr. Stimson or Mr. Knox, or by our own conscience. Some of you will go immediately to work in an industry essential to the war, some of you will go directly into one or another of the armed services, some of you will join groups engaged in the development of new technical instruments of war, some of you will proceed with further training to increase your effectiveness in a special field, and some of you will be instructors, thus multiplying your effectiveness by training others. Where these activities will take you, or how long they will last, we do not know, but we do know that they lead toward victory and that this is the first essential stage of that journey toward the high mountain of our future.

In between this immediate objective and our goal stretches that region of the foothills, a sort of no man's land, where anything can happen. In it come the future events of the war, the problems of establishing the peace, the job of reconstruction and readjustment, with concurrent economic and political (*Continued on page 256*)

Scientific Man Power

Adaptable and Essential in the Prosecution of the War, It Will Find Greater Demands in Peace

By Paul V. McNutt

BACCALAUREATE ADDRESS TO THE CLASS OF 1943

THIS hall in which we are meeting — this hall in which I am so honored to be with you on the occasion of this wartime baccalaureate service — has long been dedicated to music, one of the sweetest of the arts of peace. We are meeting in Symphony Hall today, I know, because another building, in which this ceremony traditionally takes place, is devoted continuously to the needs of the augmented wartime enrollment of your institution. Not even for the brief duration of the baccalaureate exercises is it possible for us to gather in Walker Memorial.

The 338 young men and women whose graduation is the occasion of our meeting are today in academic dress. But we know that tomorrow — and in saying tomorrow I speak only semifiguratively — approximately half of these graduates will wear the uniform of the Army, the Navy, or the Marines. And we know that those who continue as civilians will immediately enter the service of industries which are engaged in full wartime production or will enter the civil service of the United States Government itself. The very date of this ceremony — January 31, instead of some day in June — reminds us that you, today's graduates, worked steadily at your tasks throughout the past summer, the earlier to enter these vital services.

Beginning your studies, as you did, while the German armies and the *Luftwaffe* were first ravaging Poland, you have grown to intellectual maturity in the heart of this great institution at a time of crisis, when the M.I.T. has patriotically placed its incomparable facilities and equipment at the service of the nation. Like our other fine American technological schools, it has had its operations swollen by war research contracts with the Army, Navy, and other government agencies. The student enrollment, because of the establishment of special war-training courses and the presence of members of the armed forces engaged in following them, has been abnormally high. Housing has been tight. Some of the usual amenities of undergraduate life have been lacking. You have seen your field house and a large portion of your playing space taken from you for reasons of military necessity. All kinds of readjustments have taken place in your institutional life, as in your lives as individuals. The teaching and research staffs have been more than doubled. At the same time, large numbers of the regular staff have been given leave to accept special assignments with the war agencies of the United States Government. Of the regular staff members remaining at the Institute, over 200 are engaged full or part time directly on war work. There have been inconvenience, hurry, disruptions, and there will be more.

That the Institute has been called upon to play an important role in the war effort, or that it has accepted all the responsibilities placed upon it, is not surprising, for the ideal of public service has been one of its intrinsic qualities since the day of its foundation by William Barton Rogers during the Civil War. In *this* war, where technological superiority spells the difference between defeat and victory, the United States prizes more highly than ever its technological institutions. Nowhere in the country, except in such great educational centers of research as this, is there a comparable reserve of scientific man power, of new technological ideas, of laboratory facilities. In normal times, such institutions contribute to the education of our people, to the operation of our industrial economy, and to the increase of scientific knowledge. In time of war, they contribute incomparably to the fight for victory.

Your country knows, for example, that every naval constructor now in active service has done three years of graduate work in your institution after being graduated from Annapolis. Technology Alumni include the chief aeronautical engineers for the Army and Navy, innumerable test pilots, and the engineer in charge of the construction of the Alcan Highway, that great co-operative link across Canada between the United States and Alaska. As though in preparation for these services, you pioneered in founding your Department of Aeronautical Engineering, your Department of Chemical Engineering, and your Department of Electrical Engineering.

In addition to the great numbers who are fighting in strategic positions on the industrial front, nearly 4,000 of your widespread Alumni are at present in the armed services of the United States. This list lengthens each month. Some are admirals and generals, but all ranks include your graduates. Some have already given their lives. Some are missing. Some, we know, have been made prisoners. To all, we pay tribute.

I wonder, by the way, whether we shall ever learn of the reaction of one group of your Alumni on the occasion of a recent visit which they received from another Alumnus. I refer to one of the alumni clubs which, when last heard of, was quite active — the M.I.T. Association of Japan. I wonder whether they *enjoyed* the visit which they received not so long ago from their old friend, Major General James H. Doolittle of the Class of 1924. General Doolittle is at present quite busy in Africa, but I have an idea that he does not consider his visits to his Japanese fellow Alumni to be at an end. Those alumni reunions, I think it can safely be said, have barely begun and may be expected to be resumed at

the earliest convenient opportunity — convenient, that is, for General Doolittle.

I do not mean, of course, to indicate that in the loyalty and patriotism of their alumni, American technical schools differ from any other institutions of learning in this country. It so happens, however, that the contributions of technologically trained graduates are of particular value at this time. And in varying ways, the country has shown its appreciation of this fact. To a greater extent than with alumni of other kinds of institutions, your graduates are instantaneously welcomed, whether in uniform or not, into employment in the precise fields for which they have prepared themselves. Only the graduates in Architecture, I suspect, may find themselves designing objects and structures slightly different in character from those with which they had originally expected to concern themselves. But their work, too, is cut out for them in advance.

Furthermore, you have been relatively unaffected, so far, by selective service. In contrast to the last War, it has been a recognized national policy in this conflict to maintain, expedite, and increase the education of young men and women in the sciences, in engineering, and in medicine. If we were to know certainly that the crisis of this war would be passed in 12 or 18 months, sound policy would dictate calling out from our educational institutions every available man to hasten the ultimate victory. A greatly protracted war would force us, perhaps, to similar action. At the present time, we are taking every possible advantage of our ability to continue the training which provides our industries and armed forces with the needed technical talent.

Modern techniques of war and modern war equipment are based to a large extent on applications of the science of physics. The development and manufacture of such equipment have placed a heavy load on the restricted number of physicists. This demand is constantly increasing, and at the same time a new demand — a demand for persons trained to *operate* this new equipment — is rapidly becoming enormous. Many colleges and universities are now training great numbers of enlisted men and officers in advanced technical courses, and their numbers will increase many times throughout the coming months, when further Army and Navy training programs begin. This work must go on. Physics, of course, is far from being alone in its strategic wartime importance. Indeed, the list of courses and occupations considered by the War Manpower Commission as justifying military deferment of undergraduates and graduates alike reads in large part like the curriculum of this institution. This very fact, I think you will agree, amounts to a tribute from the nation at war to your technological wartime usefulness.

The recent lowering of the draft age, at both the under and the upper limits, has put into practical application the discovery which we have all heard inadequately expressed in the words, "This is a young man's war." What these words usually mean, of course, is that on the fighting fronts the speed, resiliency, and adaptability demanded by this war are such that in general only youth can supply them. We all know that there are exceptions, or rather extensions, to this statement. We know, for instance, that the young men in the grueling fight to victory are often led by older officers who are mature and experienced. On the fighting front a combination of youth and leadership is necessary to win the day.

In a very interesting way, I think, this situation is paralleled on the technological front. Nowhere — not even in the midst of blitzkrieg, which science made possible — is the rate of modern progress more rapid than in science itself. The first stage of every major operation of modern warfare may be said to be fought in the laboratory. And stage follows stage with incredible swiftness. Though difficult for the layman to believe, I am assured it is a fact that techniques and information which were unknown five years ago are today being included in *elementary* courses in your classrooms. The developments of aeronautics seem almost as swift as flight itself. Because of the secrecy made necessary by war, those of us outside the field have received only hints of the breath-taking application of electricity to entirely new aspects of communications — developments which, it is promised, will burst upon an astonished world after the war. The shortage of tin has brought swift reply from the metallurgical laboratories. Within a few years you here at the Institute have brought a theory of meteorology to such practical use that it has become our official weather-forecast method. And at the same time the theory has been so simplified that only the most advanced students require the facilities of technical schools in their studies.

On a front which moves with such speed as this, one is tempted to say that here, too, "This is a young man's war." In a sense one would be correct. Certainly many of the recent advances in aircraft design, methods of communication, medicine, food technology, and transportation have been made possible by the pioneering effort of teams of young men working in laboratories. Young men who grow up with new knowledge as it develops, who move along with the accelerated march of science, are unquestionably in a strategic position. And, of course, from the ranks of the young, science must receive its recruits if it is to continue to exist at all. Yet in science, no less than on the fighting front, youth has its leaders and gratefully pays homage to them. It is among these elder men, among these seasoned leaders in the laboratories, these experienced engineers and scientists, that one of the most interesting wartime developments in the field of science is taking place.

In all of the regular Courses offered at this Institute, except in those in Architecture and City Planning, I am told that the program of studies during the first year is identical and that during the second year, too, practically uniform curricula are followed. Only after the second year do the fields branch out and does specialization become intense. Since all the sciences are closely interrelated, these first two years, spent in the study of theory — not the theory underlying any particular engine or machine but the theory and the fundamentals of science itself — these years make for adaptability. And it is in the adaptability of the older trained scientists of America that the country is finding one of its greatest sources of wartime strength.

One of the campaigns in which the War Manpower Commission is at present engaged, in areas of labor shortage, is the encouragement (*Continued on page 262*)

Not Work, Production

After War Ends, Motives and Regulations Must Be Examined and New Definitions Established

By B. Edwin Hutchinson

ALUMNI DAY BANQUET ADDRESS

Speaking at first principally to the Class of 1943, who had formally become members of the Alumni Association on the afternoon of January 30, Mr. Hutchinson explained to them the relationship between the Institute and its Alumni. After outlining how graduates can contribute in other than monetary ways to the advancement of the institution, he discussed generally various economic issues bearing directly on academic activities. That portion of his address is basis of the article which follows. — Editor.

WHERE are substantial donations and bequests to the Institute to come from in the future? It is going to take pretty self-sacrificing Alumni, unless they live to the ripe old age of Methuselah, to save enough money to permit them to compete with the generosity of their forebears. But that is a problem with which the coming generations will have to struggle. More than the progress of this institution will suffer if the rewards for creative and productive ability are permanently circumscribed. Make no mistake, if the principle of limitation on income is once accepted, the amount will become progressively less. The pity is that the chief burden will not fall upon the men who have the ability to earn an income of any prescribed amount. Such men will soon learn to get along quite handily. The real hardship will fall upon the great masses of men who heretofore have benefited greatly by the progress occurring under the leadership of those who have made this country what it is.

Let us look at the record of this country's accomplishments. By a quick transition, we have passed now from a nation which had achieved the highest standard of living the world has ever known, to a nation forging for the defense of freedom the greatest weapons the world has ever seen. This was accomplished by a breed of men who put the emphasis on what they could produce, on the value of their service to their fellow men as it had been measured in times of peace in the free markets of this great country. Their concern has been with what they could create, what they could build. Their activities were the expression of their vision and imagination, their inventive genius, and their executive ability. When the day comes, and may it come soon, when we can again beat our swords into plowshares, let us see that the leadership of our nation is in the hands of such men. It is such men who not only had the ability, with resources accumulated by private individuals through thrift, to build the great industry and commerce upon which the progress and prosperity of this country have been based, but had the vision and the generosity to found and expand such public services as the Institute and myriads of other schools, as well as hospitals, libraries, foundations, and public benefactions without end.

I am not purposely avoiding the seamy side of our past social and economic history. There were abuses, excesses, and worse. There was plenty of room for improvement and refinement in ethics, standards, and practices. But the principle was right. Production of the material goods of life was stimulated beyond anything ever accomplished before, and it was done under conditions of freedom of enterprise, individual initiative, and private property. There was no raking of leaves designed to create an illusion that a man was earning a living. No crops were plowed under and little pigs killed, with representations that by producing less we should have more. The Sherman Antitrust Act and the Clayton Antitrust Act made it illegal for industry to conspire to restrict production for the purpose of raising prices or to agree that prices should be fixed at any level.

One of the errors of those times was that the laws designed to prevent restraints of trade were not enforced more strictly and that the scope of our free markets was

New Rogers steps as seen through the Bexley Hall gateway

M.I.T. Photo

not extended beyond our own borders. For these and other errors we paid the penalty of recurrent depressions. The proper remedy would have been more effective measures to eliminate frauds and conspiracies against the public interest. Instead we turned more and more to elaborate and confusing statutory regulations which impaired our liberties. The constructive and creative genius of our people has been obstructed and blanketed by commissions, boards, authorities, and other bureaucratic devices without end. What was designed to reform acted more frequently to repress. Do you realize that the decade of the Thirties was the first decade of regression this country ever experienced?

You members of the Class of 1943 may not be thinking much about your future place in commerce, industry, or engineering right now. Few of us are. Our minds are preoccupied with the war — a war to settle questions your fathers' generation thought they had solved for all time. Some people are hopeful we may do better this time. We should. The generation still lives which fought the first World War. That is a great deal more experience with war than most generations have had. Perhaps now that twice in one generation we have fought for freedom in foreign lands we may learn to prize it at home and to guard zealously against any encroachments upon it. I hope so.

Few of you were thinking of war when you started here four years ago. Now most of you are going to war. All of us are working on the war. War and bare subsistence are the prospect until victory is achieved. We are just beginning to realize what it means to fight a modern, total war. A few weeks before Pearl Harbor, Lord Halifax visited Detroit. Some pacifist women pelted him with eggs. One egg, thrown with a precision uncharacteristic of the feminine sex, hit him. A smaller man would have been indignant. Halifax sadly wiped the mess from his coat and remarked, "How wonderful to live in a country where they have eggs to throw!"

It is wonderful that we can be here, communing in relative peace and comfort. The M.I.T. and other similar institutions are entitled to much of the credit for the relatively happy state of affairs prevailing here as compared with the world at large. Technological aptitude serves the purposes of war no less well than those of peace. It is only modern industry, founded on science and technology, which can make war on this enormous modern scale.

Some timid souls question the real advantage to humanity of all the material progress we have made. Science, they feel, may be the progenitor of a crass materialism which, they aver, has brought us to our present predicament. Others are afflicted with a strange myopia which holds scientific progress responsible for what they call "technological unemployment." Fortunately, as time has gone on, the number and significance of people of such predisposition seem to have grown less. The manifold services to humanity of science, and of the technology based upon the discoveries resulting from science, are everywhere in evidence. Through the control and often the virtual elimination of disease, the span of life has been notably increased. Famine in time of peace has been all but banished. The rise accomplished in the material standard of living of mankind has been nothing short of marvelous. The improvement in the material lot of man since the dawn of the industrial era is incontrovertible, and the credit for this is unquestionably attributable to science and technology.

It is a thrilling record of progress and achievement, but we must admit the record is marred, and now the very permanency of the achievement is challenged, by the appalling deterioration of man's spiritual estate. As an example of organized savagery and barbarism, history offers nothing that compares in scope or exceeds in intensity the performance going on in the world at this time. John Dewey in his book, *A Common Faith*, deals with the distinction between religion and the religious attitude and deplores the fact that an historical association between religion and superstition has had much to do with an equally traditional tension, shall we call it, between a scientific and a religious attitude toward the problems of life on this earth. No one who looks about him can deny the tremendous force and power for good which men's faith, idealism, and religious convictions exercise. The necessity for a better integration of spiritual forces and scientific methodology seems to be indicated if civilization as we know and prize it is to survive. That he profits most who best serves his fellow men has come to be widely recognized as sound business doctrine. It is perfectly consistent with the golden rule. The free-enterprise system, with its recognition of the individual's responsibility for his achievement in life, is foursquare with Christian doctrine of his personal responsibility to God for his conduct on earth. Science and religion have in the past had their quarrels about various items of dogma, and each has had occasion as time went on to modify its position. Historically both are dedicated to the promotion of the dignity and liberty of the individual, while totalitarianism in all its manifestations, wherever and whenever they occur, has been conspicuous for its oppression of individual freedom and its antagonism to Christian religion.

It is interesting that M.I.T. is extending its scientific methodology into the realm of the relations of men with each other, as instanced in its activities related both to industrial management and to labor relations. It seems to me these discreet and more or less tentative developments might advantageously be broadened and intensified. It is not necessary, at least at the outset, to get into the fields of philosophy, ethics, religion, or sociology to find scope for our talents. As one looks about and listens, what is more discouraging than the almost universal lack of any adequate historical background about the most elemental questions? Time and again, particularly in the discussion of social and economic problems, it becomes apparent that many people have about the same point of view on history as that first historian of record, Herodotus, who opened his account of the world with an introduction to the effect that before the days of his youth nothing much of importance had happened. How far would our young scientists and technicians get if they entered their fields with the same naïveté? And yet how much more important than anything else that we study and learn how men may get along with each other in peace and with good will. Perhaps a little dose of concentrated (*Continued on page 268*)

THE INSTITUTE GAZETTE

PREPARED IN COLLABORATION WITH THE TECHNOLOGY NEWS SERVICE

Traditions Reaffirmed

Alumni Day Ceremonies Again Evidence Strength of the Bonds between Technology and Its Graduates

STRENGTH of the many bonds between Alumni and the Institute, emphasized frequently by speakers at Alumni Day and commencement exercises, was well illustrated by attendance at the Alumni Day Banquet on January 30 at the Hotel Statler. In spite of the added loads of wartime, over 800 Alumni were able by their presence to reaffirm the vitality of Technology tradition as Alumni Day has come to express it. To D. Walter Kendall, '24, chairman of Alumni Day 1943, and to Herbert R. Stewart, '24, chairman of the banquet committee, many congratulations were offered on the effectiveness with which the various groups concerned had done their work in arranging the programs and on the satisfying way in which the day summed up Technology spirit. To Alumni Day, with these chairmen and with Francis A. Barrett, President of the Alumni Association, presiding at the dinner, there was a distinctly 1924 tinge. It became a 1907 motif on commencement day, when Clarence D. Howe, minister of munitions and supply for the Dominion of Canada, delivered the commencement address, with five of his classmates participating officially in the program. The baccalaureate Sunday intervening saw Paul V. McNutt, chairman of the War Manpower Commission of the United States, give the baccalaureate address in Symphony Hall, paying tribute to the importance of the work of such institutions as Technology in time of the nation's need. Mr. McNutt's address, Mr. Howe's, President Compton's valedictory to the Class of 1943, and the Alumni Banquet address of B. Edwin Hutchinson, '09, former President of the Alumni Association, are published elsewhere in this issue of The Review.

. . . *Class Day* . . .

The Class of 1943 were inducted into the Alumni Association on January 30 at the Class Day exercises, for which Institute people returned to the site of the Tech on Boylston Street, the ceremonies being held in New England Mutual Hall at the corner of Clarendon and Boylston streets in Boston. Highlights of alumni interest in the proceedings, in addition to the induction of the newest Alumni, were the addresses of speakers for the 50-year and the 25-year classes; presentation of the 1943 class banner by President Barrett of the Alumni Association; presentation of the class gift to the Institute — a contribution to the Alumni Fund — by S. Richard Childerhose, President of the Class of 1943; acceptance of the gift by President Compton for the Institute; and presentation to Technology of a portrait of Horace S. Ford, Treasurer of the Institute, by the Class of 1892,

M.I.T. Photos

Before the start of Class Day exercises on Alumni Day, Kenneth Reid, '18, left center, 25-year Class speaker, forgathers with Charles E Locke, '96, Professor of Mining Engineering and Ore Dressing, Emeritus, and Secretary of the Alumni Association, left, and Charles M. Spofford, '93, Hayward Professor of Civil Engineering, Emeritus, 50-year Class speaker. To the right, John D. Mitsch, '20, Associate Professor of Structural Engineering, chairman of the Alumni Association Class Day committee, chats with John W. McDonough, Jr., '43, chairman of the senior Class Day committee.

President Compton with Robert B. Rumsey, '43, chairman of Senior Week; S. Richard Childerhose, President of the Class of 1943; and Francis A. Barrett, '24, President of the Alumni Association

M.I.T. Photo

the presentation being made by Charles F. Park, Professor of Mechanism, Emeritus, and Secretary of the Class.

The Class of 1893, celebrating its 50th anniversary this year, was represented at Class Day by Charles M. Spofford, Hayward Professor of Civil Engineering, Emeritus. Sketching the contrasts between the Technology of his undergraduate days and that of the present, Professor Spofford said in part:

In that far-off year of 1889 when we came as freshmen with hearts "young and gay," in the words of the recent popular book, conditions were quite different from those today. There was no New Deal; one did not feel that it was his right to be supported by the state, and accordingly exerted himself so as to try to be self-supporting not only in youth but also in old age. There were no radios, automobiles, or airplanes; golf was practically unknown; gasoline was used for cleaning only, and oil for lighting; in consequence, there were neither the gasoline nor oil shortages which form such important subjects of conversation today. Telephones were few, and a house lighted by electricity was rare. Highways were elementary as compared with those of today, although while we were students the Institute offered for the first time a course in highway engineering, partially financed by bicycle companies.

Citing his Class as having established the Institute Committee, Professor Spofford told of the presentation of a dormitory — Bemis Hall, named for A. Farwell Bemis, a leader in the undertaking — to the Institute to signalize the 30th anniversary of the Class. He referred to 1893 as "about an average Class" and declared it fortunate in "having had the opportunity to participate in the remarkable development of engineering and science during the last half century." Concluding, he congratulated the Class of 1943 on their graduation, saying:

You have completed the first severe test of your ability and character, since none will deny that to pass successfully through the vigorous course of training at Technology is a task which requires both brain and brawn, hard work and earnest application. In the words of Euripides: "Toil . . . is the sire of fame." Insight, understanding, and imagination, however, are also needed in order to attain full success. . . . Most of you have already been or soon will be called into military service in this war for human freedom. The country needs more than ever the services of youths like you who have received a training which fits you to master the principles and practices of a war which is predominantly technical. We older people who are unable to engage in active battle and are serving our country by using our experience and ability in designing and supervising war projects back of the line, owe you our everlasting gratitude.

Speaking for the 25-year Class of 1918, Kenneth Reid, editor of *Pencil Points*, commented upon the analogy between the position of his Class and that of the Class of 1943, in that each was met by war before it could fairly finish its four years at the Institute. Reviewing the turbulent 25 years since his graduation, Mr. Reid considered that its several divisions — war, depression, boom, depression, recovery, and war again — "are but phases of a single, vast, revolutionary process . . . part of the growing pains of humanity during which the human race has been emerging — skeptically and in some degree unwillingly — from the history-long era of scarcity into the new technological era of abundance." Turning to the future, Mr. Reid continued:

We can't very well imagine letting the war come to an end suddenly with no plans at all for effecting the great transition to peace. . . . We shall have to have . . . a plan of reorganization to get people gradually back to peacetime activities, or we shall risk a greater catastrophe than the war itself.

The plans will have to be broad enough and flexible enough to take care of all interests involved, both public and private. . . . I believe that we can and must plan to achieve a condition of full employment for all employables. I believe that every young man or older man who has gone or will go to the fighting fronts deserves to find a full and fair opportunity to work when he returns. . . .

I believe that one of the principal means of providing full employment after the war will be found in the rehabilitation of our cities. Our American cities, fortunately, have not been bombed. That they will suffer from direct destruction seems unlikely. Yet they have been over a long period suffering from the slow destruction of blight due to unplanned or imperfectly planned growth. There are slums in all of them, representing lost values. These values can be restored or replaced by the application of proper replanning measures. City planners, architects, and other technicians know how it can be done.

Mrs. Compton becomes an honorary member of the Alumni Association at the banquet on the evening of Alumni Day, receiving a bouquet of roses from President Barrett.

M.I.T. Photo

They will have to win the support and intelligent backing of the public in each community so that it will be done. The economists and real estate interests are even now coming into some general agreement as to the practicability of the process of urban rehabilitation. It will take a generation, or possibly two, to accomplish the transformation. When it is finally effected, our cities will be truly civilized places in which to live and work. And doing the job will employ millions in a great variety of occupations — working for the private developer as well as for public authority of one kind or another.

The future promises plenty of work for young technologists, Mr. Reid declared, urging the members of 1943 to hold fast to the Technology tradition of logical thinking in the pursuit of truth. Thus, he held, they would be assured of meeting well the many new and unprecedented problems to be foreseen in time to come.

. . . *Stein on the Table* . . .

It was "Yes, we have no bannanners" at the Hotel Statler on the evening of Alumni Day, for Boston fire regulations forbade the colorful display of class banners which had been a feature of Alumni Banquets in years past. The evening meeting, however, more than made up in other ways for the absence of the customary silks.

The steins — designed by Henry B. Kane, '24 — were on the table, and plenty of good songs were ringing clear, with Orville B. Denison, '11, leading the singing and George Wheeler as soloist. The senior Class of 1943, their commencement only a day or so distant, were present in full strength as guests of the Committee of Alumni Hosts, and their President, S. Richard Childerhose of Wilbraham, was there to speak for them. Last year's ebullience as provided by 1937 was this year injected into the ceremonies by 1938, but it was a controlled ebullience and nobody minded. The underlying mood of the evening was serious, as should be expected in days like these; but the spirit was that of comradeship and celebration.

That mood and spirit especially marked a part of the program new this year — brief messages of greeting and Godspeed addressed particularly to the men of 1943 by fellow Alumni in the high command of the Army and Navy. Brigadier General Alden H. Waitt, '14, of the Chemical Warfare Service; Rear Admiral Ralph Whitman, '01, of the Civil Engineer Corps, Headquarters Third Naval District; and Rear Admiral Julius A. Furer, '05, Federal co-ordinator of research and development for the Navy, Office of the Secretary of the Navy, had found it possible to be present at the banquet, and so delivered their greetings in person.

By letter, cable, and telegram other M.I.T. men ranking high in the armed forces of the United States and Canada sent a good word as well. These included Brigadier General Stuart C. Godfrey, '07, air engineer, Army Air Forces; Rear Admiral Emory S. Land, '07, chairman, United States Maritime Commission; Rear Admiral Alexander H. Van Keuren, '07, director, Naval Research Laboratory, Anacostia Station, D. C.; Rear Admiral Herbert S. Howard, '09, Bureau of Ships; Brigadier General Lawrence B. Weeks, '11, commandant, Coast Artillery School, Fort Monroe, Va.; Major General James V. Young, '13, Canadian Department of National Defence; Rear Admiral Ernest M. Pace, Jr., '17, Bureau of Aeronautics; Brigadier General Forrest E. Williford, '17, commanding, Antiaircraft Replacement Training Center, Fort Eustis, Va.; Rear Admiral Edward L. Cochrane, '20, Bureau of Ships; Brigadier General Lyman P. Whitten, '20, Army Air Forces; Major General Richard Donovan, '21, commanding, Eighth Service Command, Services of Supply, Dallas, Texas; Brigadier General Alfred B. Quinton, Jr., '21, Detroit Ordnance District; Rear Admiral Howard L. Vickery, '21, vice-chairman, United States Maritime Commission; Major General Wilhelm D. Styer, '22, chief of staff, Services of Supply; Brigadier General John K. Christmas, '23, acting deputy chief of ordnance, Tank–Automotive Center, Detroit, Mich.; Brigadier General Russell E. Randall, '23, commanding, XXVI Fighter Command; Brigadier General Stephen G. Henry, '24, commandant, Armored Force School, Fort Knox, Ky.; Brigadier General Gordon M. Wells, '24, Ordnance Department; Brigadier General Wilmot A. Danielson, '26, Quartermaster Corps; Brigadier General Charles E. Loucks, '31, Chemical Warfare Service,

M.I.T. Photos

President Barrett calls the Alumni Banquet gathering to order. Greetings are presented by Brigadier General Alden H. Waitt, '14, Rear Admiral Ralph Whitman, '01 and Rear Admiral Julius A. Furer, '05.

Rocky Mountain Arsenal; Brigadier General William C. Kabrich, '33, Chemical Warfare Service, Edgewood Arsenal.

. . . *Mrs. Compton Accepts* . . .

Different in kind but not in degree was another expression of friendliness in the proceedings, when Charles E Locke, '96, Secretary of the Alumni Association, escorted Mrs. Karl T. Compton to the speakers' table, where, to the accompaniment of applause and cheering, she accepted from President Barrett a sheaf of red roses. Thus was symbolized her induction into honorary membership in the Alumni Association.

. . . *General Doolittle Presides?* . . .

The Class of 1924 presented an emergency matter to the general meeting rather than through regular channels when Henry B. Kane, Director of the Alumni Fund, speaking ostensibly on behalf of his classmates, pointed out that the President of the M.I.T. Association of Japan is now serving his second term in this office. Arguing that it is against all democratic principles for this situation to continue longer, Mr. Kane urged the Alumni Association to appoint a new president, saying:

I therefore submit for your consideration the name of such a man. A member of the Class of 1924, we believe it would be impossible to find a more worthy candidate. I can't say that he is a man with both feet on the ground — in fact, just the reverse. He is well known to our Tokyo Alumni, as he paid them a flying visit quite recently, and although he was not exactly welcomed with open arms, he did leave calling cards. I refer, of course, to that famous world-traveler, the man whom 1924 is backing for President of the Tokyo Club — Jimmy Doolittle.

. . . *The Road Ahead* . . .

What the future may hold for science and for society, how it may be expected to affect the affairs of the Institute, and what action can be reckoned on to influence it rightly, were subject matter for the addresses of the principal speakers of the evening, B. Edwin Hutchinson, '09, former President of the Alumni Association, and President Karl T. Compton. Dr. Compton's annual résumé of Institute affairs, which this year paid especial attention to problems later to be encountered, was greeted by the intense interest which has always marked alumni reception of it. Of particular note, among the salient portions of his address which follow, are observations on the questions which readjustment to peacetime activities will bring before institutions of higher learning such as Technology. Dr. Compton said in part:

I want to pay tribute to two groups who deserve our special gratitude and admiration. The first group is the staff of the Institute, who by their loyalty, energy, and ability are enabling the institution to carry on a sound and effective educational program under circumstances which are extraordinarily taxing and confusing. A large number of this staff are on whole or partial leave of absence from teaching duties and are enrolled in the armed services, in the war agencies of research and development, or in industrial production. The variety of their services is large; the importance of their contributions is even larger. The rest of the staff are carrying extraordinarily heavy loads of teaching in connection with our regular program, plus the numerous special training programs which are being carried on for the War or Navy Department or for the United States Office of Education.

In the work of the staff to help win the war, each member is specializing in a job which is urgently needed and which he can do well, and we can be proud of the cumulative results. I speak of this feelingly because my war duties during the past two years have diverted me to a large extent from the affairs of the Institute, and it is a source of great gratification to me that our internal organization, through the efficiency of the administrative officers and the co-operative loyalty of the staff, has enabled our program to go ahead smoothly.

The second and much larger group to which I would pay especial tribute are the many M.I.T. Alumni who are now serving their country as members of the armed forces. As of January 21, 3,702 Alumni were in service: 2,552 in the Army, 1,095 in the Navy, 28 in the Marines, and 27 in the Coast Guard. This number will be swelled by several hundred more as many of the members of the graduating class and some of

our undergraduates are inducted shortly after February 1. It was to me startling to realize that one-tenth of all the living Alumni of this institution, of all ages, are now in uniform. This is particularly significant when we remember that an enormous number of our Alumni are also in civilian positions which are essential to the war effort — positions in engineering design, in industrial production, and in research and development of instruments and materials of warfare. . . .

When I think of the courage of these men in uniform and the service which they are rendering, and when I think at the same time of the absolutely essential supplementary service which is being rendered by our Alumni in civilian capacities in work of great variety in the support of our country in this crisis, I confess to a feeling of enormous pride in the privilege of serving this institution. I know this is shared by all of us.

. . . *Problems* . . .

Observing that restrictions of secrecy surrounding practically all of the Institute's research work had given him "the disposition of a clam," Dr. Compton went on to survey the effect on Institute operations of the selective service program and the Army and Navy training programs. Reduction of enrollment from about 2,900 to about 1,600 civilian students by the end of this academic year in June is, he said, to be foreseen. In addition to the 1,600 civilians, the Institute can accommodate about 2,000 of the Army and Navy students whom the services are to reassign to educational institutions under present plans. "If we were asked to do more than this," Dr. Compton said, "we could do so only by acquiring new housing facilities, the possibilities for which appear to be very limited." Pointing out that there are a number of special technological fields in which the Institute can advantageously co-operate with the Army or Navy, Dr. Compton said:

We must be careful not to permit our facilities to be completely absorbed by students in only one or two special branches. If we were to do that, we could fill our dormitories but we could not advantageously utilize the varied capacities of our staff and laboratories. The ideal situation for us would be one in which we would be called upon to handle a variety of groups in the various engineering and scientific fields — groups of perhaps from 50 to 500 in any one category. In this manner, our facilities for education and for housing could both be used to maximum advantage. We hope that we may be permitted to work out plans of co-operation along these lines with the Army and Navy. We should be very well satisfied with our contribution in the field of education and training if we could maintain our total enrollment of civilian, Army, and Navy students at about our normal figure of 3,000. Handling these in addition to the considerable number and variety of war research projects would pretty well tax the capacity of our facilities. . . .

M.I.T. Photo

Clarence D. Howe, '07, commencement speaker, President Compton, and B. Edwin Hutchinson, '09, Alumni Banquet speaker, before the gathering on the evening of Alumni Day

Paul W. Cloud

The portrait of Horace S. Ford, Treasurer of M.I.T., painted by Harold Brett, which was presented to the Institute by the Class of 1892 at Class Day exercises

Describing the recent adoption by the Institute of a completely accelerated program, which calls for continuous year-round operation of classes, Dr. Compton explained that the program of training for Army students will have to be adjusted to a very flexible schedule in view of the fact that students detailed to school by the Army will generally arrive not at the beginning of semesters but from time to time as may be convenient to the Army. Then turning to the future, the President said:

Looking ahead to the period immediately following the war, we shall face a new set of problems at M.I.T. — problems which in general will be common to all higher educational institutions. For one thing, to change back from the accelerated program of study all round the calendar to the normal four-year academic schedule will be an expensive operation. This additional expense will arise largely from the fact that for a year or so during the return to normal we shall have only three academic classes instead of four, and consequently there will

be a reduced tuition income. We have estimated that it will probably cost M.I.T. about three-quarters of a million dollars to make the transition from the accelerated to the normal program after the war. This will be an exceedingly difficult financial situation to meet.

One thing which will make the project the more difficult is the fact that, even with ordinary student enrollment, we shall probably lose money while we are on the continuous three-term program during the war. This is because student tuitions do not carry the full cost of operating the institution. The balance is carried by income from endowment. Tuition income will, of course, be increased if students are here for three terms instead of two, and this will help to meet the added cost of the third term. But that portion of the income which comes from endowment will not be increased, so that the third term may involve a deficit. There is some question, furthermore, as to how much tuition or equivalent payment will be received from Army or Navy students sent to us under contract, in view of the fact that our present tuition at M.I.T. is higher than that of any other college, university, or technical school in the country. In dealing contractually with the Army and Navy, this competitive feature may operate to our disadvantage.

Another problem which will require careful planning and administration at the end of the war is concerned with the probable postwar enrollment of students. At the end of the last War, the enrollment went to an excessively high figure, unfortunately far beyond the capacity of our classrooms, laboratories, and staff to handle efficiently. My colleagues who were here then unanimously report that at that time we went through some three or four years of educational nightmare.

The same situation may have to be faced at the end of this war, when we shall have coming to us not only the normal annual crop of graduates of secondary schools but also many young men whose educational programs were cut short or postponed completely on account of war service. We shall have to handle this situation skillfully in order to prevent a crowding of our facilities and an unbalanced distribution of our staff which will interfere with the standards of our educational work, not only at that time but for many years to come. I mention this latter point because an administrative study of our staff distribution in the various grades shows very clearly that we are still suffering from the unbalanced recruitment of staff which took place to meet the overcrowding in the years just following the last War.

Still on the side of future difficulties, I must refer to the financial outlook. This institution has been blessed by the generosity of a few wise and noble individuals. Their gifts have been supplemented by a very large number of smaller gifts from persons who have been equally wise, noble, and altruistic in their point of view but unable financially to contribute large sums.

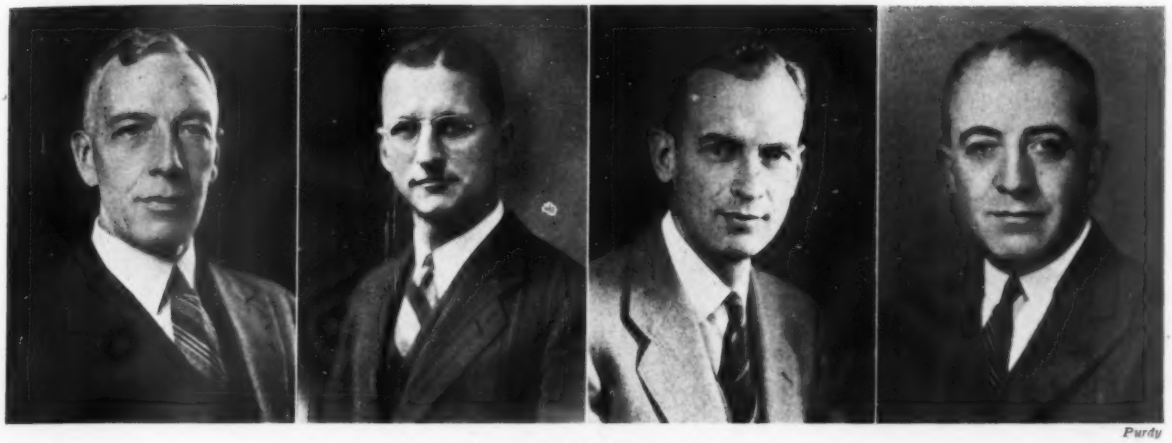
I think everyone agrees that under the present and prospective schedules of taxes, governmental regulations on salaries, and other handicaps, it is very unlikely and perhaps totally impossible that individuals will in the future be able to build up the large fortunes which had been possible in the days of rugged individualism and free opportunity of the past few generations. At least such opportunities will not come unless there is a very marked change in the current thinking, feeling, and trends in the country. Consequently, if we are to remain a top-grade privately controlled institution, our only hope of adequate financial support in the future must be centered in two groups: first, those still surviving friends who have in the past been able to accumulate great wealth and who see in the work of the Institute an inspiring opportunity for the permanent use of their wealth for the public benefit; second, the great number of citizens and Alumni of much more modest means who may for similar ideals be induced to contribute to education in smaller sums.

After the war I can see the possibility of a severe financial problem in this institution, the meeting of which may seriously curtail its future strength if the requirements have to be met out of currently available funds. On the other hand, I can see ahead the opportunities for a strength and value of this institution as a national asset far beyond anything which has ever before been achieved or perhaps even considered possible. To achieve this we must find the funds not only to pass through the readjustments back to normal at the end of the war but also to capitalize on the great opportunities which will then exist for strengthening our staff, for the effective utilization of some of the fine new laboratories, and for the development of some of the important new techniques which have become centered here as a result of the current war effort.

Phillips

FOR PRESIDENT

. . . of the Alumni Association of the M.I.T., the National Nominating Committee this year has designated Francis J. Chesterman, '05, of Germantown, Pa., Vice-president for operations of the Bell Telephone Company of Pennsylvania and the Diamond State Telephone Company, with headquarters in Philadelphia. A life member of the Institute Corporation, Mr. Chesterman served the Alumni Association as vice-president in 1929–1931 and is also past president of the M.I.T. Club of Western Pennsylvania. He joined the engineering department of the American Telephone and Telegraph Company in Boston in July, 1905, going thence to the New York Telephone Company in 1907, and to the Bell Telephone Company of Pennsylvania in 1920, where after holding various executive engineering posts he became vice-president for operations in 1941. Mr. Chesterman, who holds the honorary degree of doctor of engineering from the University of Pittsburgh, is a fellow of the American Institute of Electrical Engineers and a member of the Army Ordnance Association and the Franklin Institute. His directorships include the Bell Telephone Company of Pennsylvania, the Diamond State Telephone Company, the Fidelity-Philadelphia Trust Company, the Pennsylvania State Chamber of Commerce, and the Chamber of Commerce and Board of Trade of Philadelphia. He is a member of the Philadelphia Council, Boy Scouts of America, and of the Public Charities Association of Pennsylvania.



Purdy

TO THE CORPORATION

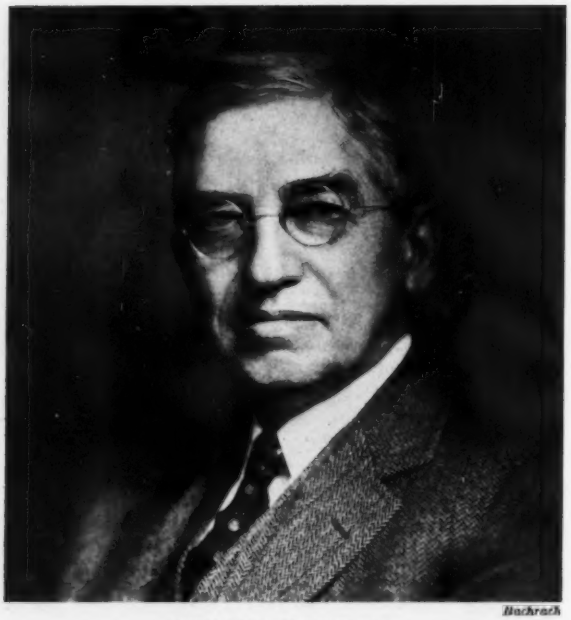
. . . for term membership these four Alumni have been this year named by the National Nominating Committee. From left to right they are Irving W. Wilson, '11, Vice-president in charge of operations, Aluminum Company of America, Pittsburgh, who will complete the term of the late Alfred H. Schoellkopf, '15; Walter J. Beadle, '17, assistant treasurer, E. I. du Pont de Nemours and Company, Wilmington, Del.; Donald F. Carpenter, '22, Vice-president and director of manufacture, Remington Arms Company, Inc., Bridgeport, Conn.; and Francis A. Barrett, '24, retiring President of the Alumni Association, head of the publicity department, New England Telephone and Telegraph Company, Boston.

On the favorable side for the future, in addition to the potential opportunities which I have just mentioned, are several matters in which I feel that our situation is encouraging. For one thing, we have been carrying through during the past 10 years, and quite largely as a result of the efforts of our former Vice-president, Vannevar Bush, '16, a systematic restudy and formulation of matters of administrative policy in every aspect of the institution's activities. As a result of these studies, we are able now or at any time in the near future to carry on our operations with a confidence, skill, and precision which would have been impossible 10 or 12 years ago. Simultaneously during this period there has been proceeding a continuing intensive study of some of the most fundamental aspects of our educational program. These studies have resulted in revisions of our curricula and in improvements in our methods of instruction. Many of these changes have recently been put into effect and a few of them are ready for use just as soon as conditions are normal. For these reasons I feel that the institution, internally, is in an extraordinarily favorable position for moving ahead into peacetime activities.

Another favorable situation for the near future and the postwar period results from the extent to which the war activities in research, development, industrial production, and military use have brought members of our staff into mutual contact with men in industries and in the armed services. These contacts have resulted in greatly increased mutual respect and understanding between the personnel in these groups. In saying this I am not speaking hypothetically but as a result of the close observation of this trend in some of its very significant aspects. The industrialist who a few years ago was inclined to view the academic scientist or engineer as an impractical sort of person is now the first to admit that these men have proved their ability to make practical developments of great ingenuity and originality. At the same time, the academic men who have in the past been somewhat inclined to consider their industrialist brethren as bound by traditions and not sufficiently open-minded to accept new ideas with enthusiasm have come to appreciate much more clearly the procedures and attitudes which are necessary to bring an ingenious conception into practical use on a large scale. Because of this mutually increased understanding and respect, the postwar period should see a far more fruitful degree of cooperation between the research facilities and the staffs of educational institutions and industry than has ever existed before, and this should be beneficial not only to the educational institutions and the industries but especially to the public, who are the ultimate beneficiaries of the activities of both groups.

One of the opportunities which may be favorable in the future and which may assist us in solving some of our financial problems may be found in the patents granted on inventions by members of the staff and administered commercially in such manner as to bring a modest return to support further research and educational activities. Through arrangements made with the Research Corporation in New York for the handling of such patents, we have gained considerable experience during the last eight or ten years. We have found how to handle patents in an educational institution of our type in a manner which is clearly in the public benefit and which cannot endanger the institution from a public relations or a legal point of view. While the war has temporarily interrupted this aspect of our activities and while we cannot point to any one discovery which promises to bring in a very large income, nevertheless the indications at the present time are that the income from this source may be substantial enough to strengthen in a significant way our facilities and opportunities. Perhaps more important than the financial aspect is the fact that the arrangements which have been in force in recent years have been highly acceptable to the members of the staff and have removed sources of worry and irritation which had previously been bothersome.

As we look ahead, I think that one matter of policy will be generally admitted to be advantageous. That is the policy of concentrating our efforts in the most important fields of technology and not, through ambition or overenthusiasm, spreading our resources and activities too thinly over too many fields. If our resources were unlimited, then we might undertake to center here at the Institute the finest program to be found anywhere in the world in every aspect of science, engineering, architecture, and business administration. Obviously this is far more than we can do with limited resources. It becomes important, therefore, to make wise decisions from time to time in regard to the directions in which our efforts and resources will yield the most valuable results, from the point of view of public welfare and the scope of our charter.



Bachrach

PHILLIPS KETCHUM

Recently elected special term member of the Institute Corporation

The directions of most advantageous effort may occasionally change, and when they change there may be many regrets. We may, furthermore, make mistakes from time to time in our judgment as to the relative values and opportunities in various fields, new and old. The principle, nevertheless, I believe to be important. We should at this institution have no program which is not of top-notch quality and effectiveness. We should undertake work in as many technological fields as we can handle, subject to this criterion of high quality. If in the future our resources should become too limited to meet the opportunities which we should like to grasp, then I believe that we have only two alternatives: The one is to find the additional resources necessary to utilize these opportunities, and the other is to perform whatever amputations may be necessary to reduce our program to the dimensions which can be carried on successfully at the level of standards for which Technology has become notable.

In conclusion, let me describe briefly an idea which occurred to me recently as I was thinking about the way in which the war is interfering with the educational programs of those of our students who are being called away to the armed services from the middle of their academic careers. They are doing this at a substantial sacrifice in order to serve their country, and the country is demanding this sacrifice of them. What will be their situation when the war comes to an end?

At that time there may be ten million or more members of the armed forces who will be demobilized as quickly as feasible and who will wish to get back to their ordinary civilian pursuits which the war had interrupted. At that time, however, the country will not be able immediately to absorb these ten million men and women, for time will be required to transform our industrial plants and our business organizations from wartime to peacetime operation. I believe that it is inevitable, therefore, and entirely proper, that the government should assist in this transition, both for the individuals concerned and for the business organizations involved, in order to taper off from wartime activities and taper up into normal pursuits.

I for one, and I believe that most of you, believe firmly in the general principle that the less control which government exerts over business and over private lives, and the fewer governmental subsidies or bounties there are, the better for all concerned. But I think that we also cannot but admit that the government is going to have to do some things in a very large way during this immediate postwar transition period unless there is to be an enormous amount of suffering and a period of unemployment and depression which will make that of the early 1930's appear like good times. I am assuming, therefore, that the government will sponsor some type of program of public works, of housing construction, and of incentives and assistance to industry in building up its normal peacetime activities.

What I should like to suggest is that a part of this tapering program should include a provision whereby those college men whose careers were interrupted by call to military service should have the opportunity to apply for governmental scholarship aid within a limited period after the end of the war in order to enable them to return to their educational institutions to complete their training. I believe that such a move would be a wise one from the standpoint of the country at large in that it would be assisting to build up a highly trained and educated group of young men to fill the gap which will otherwise have been left as a result of the interruptions of the war.

The importance of such a group to the country cannot be overestimated. We see right now in our crisis that even after years of peace we have a dearth of man power of the training and qualifications required in this emergency. Our country could do nothing which would bring greater returns in increasing its potential strength and raising its cultural level than to take steps after the war to facilitate the filling of these educational gaps. Many men who would have gone through with a liberal arts course have been diverted to the more highly practical technological courses at an elementary level, and unless they have an opportunity later to pursue their cultural courses the country will be the loser. Similarly, many young men who would have been going through their courses of undergraduate and postgraduate education in the sciences and in engineering have been diverted from these courses into the armed services or have been able to complete only the elementary portions of their training. The loss of these men will be a permanent loss to the productive capacity of the country, and they will be urgently needed in the succeeding years to man our industries, laboratories, and educational institutions. Therefore, as part of any program of useful work or of assisting industry and labor to return to normal, I should suggest the inclusion of a program in the field of education which will permit those whose education has been cut short by war service to have the opportunity to complete that education.

History has shown that great educational institutions are among the most permanent of human institutions, outlasting dynasties, governments, and social epochs. Probably they are second only to the church in enduring quality. So I do not doubt that Technology will be a potent influence in the life of America long after you and I and our problems have passed on. But the future character and power of the Institute will be profoundly influenced by what we can do for it during the next critical decade. I ask, with confidence, for your continuing and earnest interest and help in our great altruistic enterprise.

Corporation Election

PHILLIPS KETCHUM, prominent corporation lawyer of Boston, was elected a special term member of the Institute's Corporation at its meeting on February 2. He has been a member of the firm of Herrick, Smith, Donald, Farley and Ketchum since 1917.

Born in Portland, Maine, in 1884, the son of Charles J. and Rebekah Kimball Ketchum, Mr. Ketchum prepared at Noble and Greenough's (*Continued on page 276*)

The shape of things to come is no secret

THE humming noise you hear is industry at war. When peace comes, that sound need scarcely change its pitch. For in business offices, on assembly lines, in civilian defense centers, and at home, American women are already wishing up new things for industry to make.

They want us to help them keep house, to supply new equipment for it on a scale that makes past performances seem like only practice. Home laundries that "do" everything from tablecloths to negligees. Ranges complete with pressure cookers and unbreakable transparent ovens. Refrigerators with compartments that hold each food, from frozen meats to lettuce, at the ideal temperature and humidity.

Whatever makes housekeeping easier and more economical, women will be waiting for industry to supply. The problem is not what to make, but *how*. Which material, new or old, will contribute the most in beauty, strength, economy, to each part of the new design? How shall it be used, fabricated, finished? Where can it most effectively save weight, cost, time?

For impartial answers to questions about metals industry can turn to Revere. For just as industry in the future will not be restricted to the traditional materials, neither will Revere. In addition to broadening still further the uses for copper and its alloys since the start of the war, Revere has developed facilities for the manufacture of the light metals, and is pioneering in the production of entirely new alloys with important properties that can cut manufacturing costs for many industries.

Today the copper industry is working all-out to win the war. No copper is available for anything else. But post-war planners with specific problems in metals are referred directly to the Revere Executive Offices in New York.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

Executive Offices: 230 Park Ave., New York

"AN OUTSTANDING CONTRIBUTION TO VICTORY"

The men and women of Merck & Co., Inc. are proud to announce that *The Army-Navy Production Award* has been conferred upon them for "great work in the production of war equipment."

Symbolic of distinguished service to America, the Army-Navy "E" Flag now flies above our main Plant at Rahway, New Jersey, and the "E" Pin has been presented to all our workers as evidence of the fact that they are making "an outstanding contribution to Victory."

The production of essential drugs and chemicals for America's Armed Forces and civilian population, and for those of the United Nations, demands the utmost in care, skill, accuracy, and craftsmanship. Scientific research, rigid analytical control, and greatly expanded manufacturing facilities—combined with *esprit de corps* and thorough cooperation between labor and management—have made it possible for us not only to meet the increasing demands of our Government for millions of finished products, but to supply the basic chemicals necessary for production by hundreds of other concerns in every branch of industry.

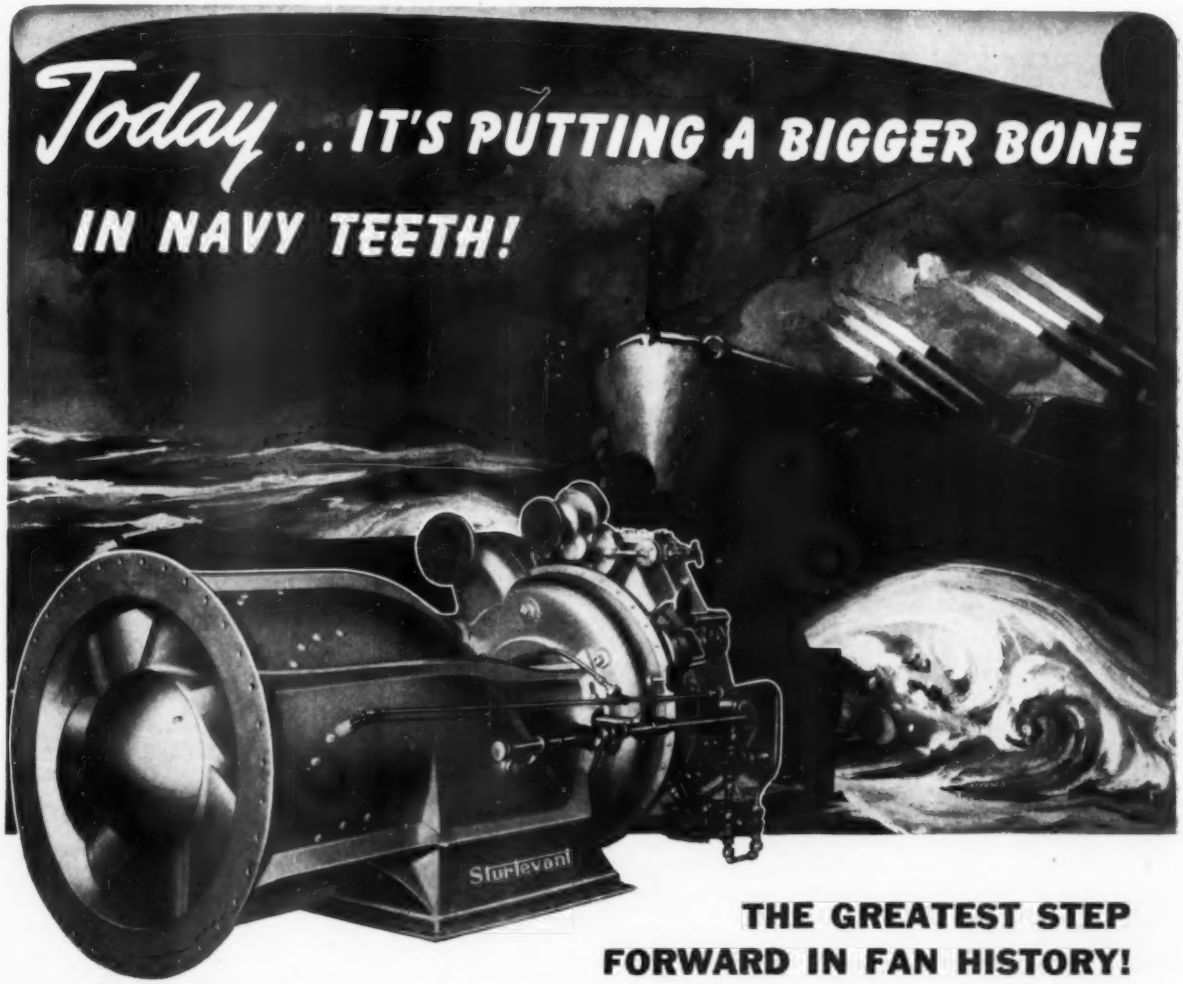
In accepting the award conferred upon us, we have joined together in assuring the officials of our Army and Navy that we will not relax our efforts, and that they can count on us for continued all-out production until this war is won.

MERCK & CO., Inc. *Manufacturing Chemists* **RAHWAY, N. J.**

★ *Fine Chemicals for the Professions and Industry Since 1818* ★

FOR SHIPPING.....IT'S *The Fan of Tomorrow!*

Today .. IT'S PUTTING A BIGGER BONE IN NAVY TEETH!



THE GREATEST STEP FORWARD IN FAN HISTORY!

NEW STURTEVANT
Victory AXIFLO Fan
FOR NAVY FORCED DRAFT

☆

SAVES SPACE, WEIGHT, POWER

It's the greatest achievement of Sturtevant's 82 years of Fan Research . . . an Axiflo Fan that hits a new high in fan efficiency, in power savings, and in axial flow fan operating pressures.

TODAY—the *Victory* Axiflo Fan is saving weight, space and power aboard battleships, cruisers—in fact, every type of naval vessel—providing greater fuel and ammunition carrying capacity. The needs of our nation's Navy must be met first, and for the duration the new fan will be restricted to Naval use.

TOMORROW—when intensified competition returns, making every saving an important factor in successful operation, the new Axiflo Fan will be available to the entire marine industry—to bring new economies to heating, ventilating, and mechanical draft. Learn about this remarkable new fan development in Bulletin No. 460. A copy will be gladly sent on request.

B. F. STURTEVANT COMPANY
Hyde Park *Boston, Mass.*
Branches in 40 Cities

Sturtevant
Puts Air to Work

'01 G. W. ALLEN
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'20 A. B. WASON
'22 J. E. KARCHER
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'24 R. E. REID
'32 D. C. HATHAWAY
'34 J. H. SPENCER
'35 J. F. SNOW

FOUNDER OF THE AIR HANDLING INDUSTRY

We invite a forward-looking

MACHINERY MANUFACTURER or INVENTOR

to plan with us NOW for post-war expansion

War work has caused us to greatly increase our productive capacity. So when peace comes, we will have the equipment and trained personnel to manufacture not only our regular line of wrapping machines, but other types of machinery or devices. You may find it profitable to take part in our planning for such post-war expansion.

For 30 years we have been one of the leading makers of packaging machinery. Our machines are used by hundreds of concerns—in the food, drug, candy, tobacco, dairy fields, etc. Many of the advancements in mechanical wrapping now widely used were conceived by our Engineering and Designing Department.

For war. we have *designed and built* large groups of armament machines such as cartridge loaders, cartridge-clip loaders, machines to insert cartridges into cartons, linking machines for machine-gun bullets, etc.

We are now working on ideas to expand our regular line of wrapping machines and to add other lines of machines used by industries we do not now serve.

● You may have ideas for new machinery which need development. We will be glad to discuss them with you, and if mutually satisfactory, will develop them with you.

● You may have a machine or machines which you have been making in your own plant, but which might be improved and made with greater profit in ours.

Final arrangements may result in your coming into our Company—or may be worked out on some other desirable basis.

If you feel that you have something on which we might work together, we suggest that you communicate with us, giving full particulars. We can then arrange for a meeting.

PACKAGE MACHINERY COMPANY
Springfield, Massachusetts

ENGINEERS IN WARTIME

(*Continued from page 234*)

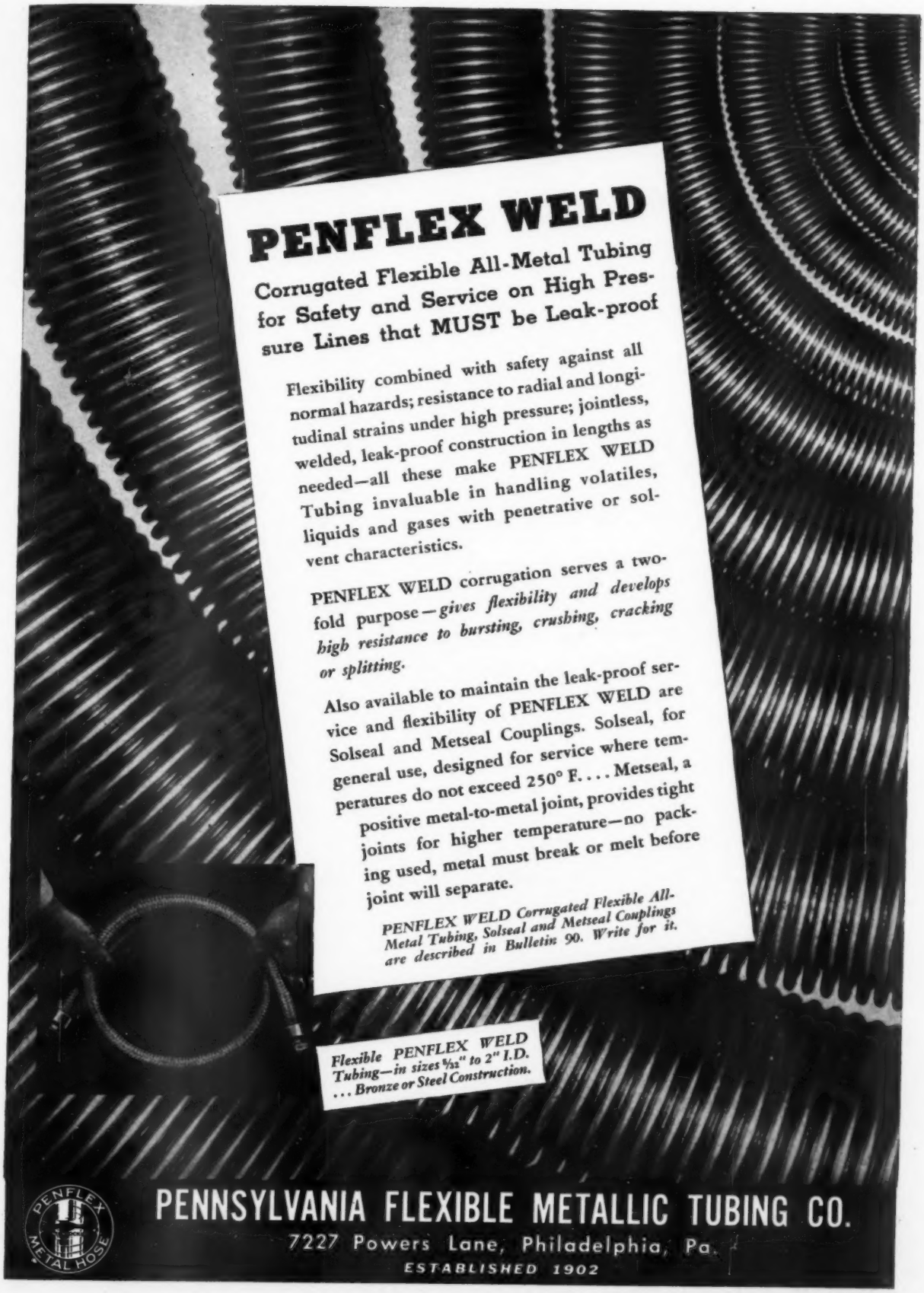
and, at the same time, maintain a scale of profit which is reasonable. The cost plus percentage contract of the last War has been abandoned, often in favor of target-price contracts, which allow a slightly larger profit if the target price is bettered and a smaller profit if it is exceeded. These three objectives of war buying are maximum output, low production costs, and close profit control. All three objectives are sometimes inconsistent with each other and cannot be obtained in every situation, but I think it can be said broadly that swollen profits from war contracts are not the order of the day.

A major problem of war production is found in the rapidly changing needs for weapons and supplies. To provide initial equipment quickly calls for a larger industrial output than is needed to furnish replacements, whatever the scale of battle may be. Thus, new plants must be built and put into full-scale operation for brief periods and then be subject to sharp curtailment of output. As a result of combat experience, new weapons are developed which may require the complete retooling of plants that have barely begun to produce weapons of the older type. Just as nothing is static about war, little is static about war production. Men and women working in war plants, working with all possible patriotic zeal and energy, find it difficult to understand why there must be a layoff for retooling, with consequent lost time in production. All this is a headache to those responsible for war production, but one which is inevitably associated with that work.

In the organizing of a nation for full-out war production, we must remember that the total output depends in part on the creation of new productive capacity and in part on the ability of the civilian population to do without. Hitler put the situation before his people very clearly when he said they must give up butter in order that the army might have guns. Thus we find that in order for our own armies and ships and aircraft to operate, our civilian population must use less gasoline and less rubber. In order that we may feed our fighting forces, civilians must be deprived of certain foodstuffs. In order that adequate materials may be provided for munitions, civilian uses of those materials must be prohibited or limited. To fight a total war without encroaching on the living standards of the civilian population is impossible.

Similarly, the financing of war involves the curtailment of civilian expenditure. Augmented industrial tempo resulting from the war brings to the population increased and more diversified earnings, which must be channeled back to pay for war expenditures, either through heavy taxation or through borrowing. By rigid discipline, a nation should be able to finance anything that it can produce physically. On the other hand, lack of discipline in civilian spending may easily lead to inflation, and inflation is capable of destroying the ability of a nation to achieve its war objective. All countries at war find it necessary to regulate prices, to ration many articles that can usually be bought freely, and to curtail and regulate luxury spending. The prob-

(*Continued on page 254*)


PENFLEX WELD
Corrugated Flexible All-Metal Tubing for Safety and Service on High Pressure Lines that MUST be Leak-proof
Flexibility combined with safety against all normal hazards; resistance to radial and longitudinal strains under high pressure; jointless, welded, leak-proof construction in lengths as needed—all these make PENFLEX WELD Tubing invaluable in handling volatiles, liquids and gases with penetrative or solvent characteristics.
PENFLEX WELD corrugation serves a two-fold purpose—gives flexibility and develops high resistance to bursting, crushing, cracking or splitting.
Also available to maintain the leak-proof service and flexibility of PENFLEX WELD are Solseal and Metseal Couplings. Solseal, for general use, designed for service where temperatures do not exceed 250° F. . . . Metseal, a positive metal-to-metal joint, provides tight joints for higher temperature—no packing used, metal must break or melt before joint will separate.
PENFLEX WELD Corrugated Flexible All-Metal Tubing, Solseal and Metseal Couplings are described in Bulletin 90. Write for it.
Flexible PENFLEX WELD Tubing—in sizes 5/32" to 2" I.D. . . . Bronze or Steel Construction.
PENFLEX METAL HOSE
PENNSYLVANIA FLEXIBLE METALLIC TUBING CO.
7227 Powers Lane, Philadelphia, Pa.
ESTABLISHED 1902

ENGINEERS IN WARTIME

(*Continued from page 252*)

lem comes down to that alternative of Hitler's — guns or butter? Let us realize that civilian controls are a necessary by-product of war and not be impatient with those responsible for the administration of them.

Perhaps the most difficult problem of any country at war is the efficient mobilization of man power. All countries have accepted the view that man power for the armed forces should be chosen by conscription. The difficulty comes in working out a method of assigning men and women to industry, to the farms, to the forests, and to the mines, and doing so fairly and efficiently. I doubt the possibility of evolving a method for such assignment which can be wholly efficient and equitable. Every effort is warranted to bring about the desired result — effective mobilization for war — and each country is developing its own pattern for so doing. The efficient use of man power and woman power will be a problem that will increase in magnitude from now until the end of the war; failure on the part of those in authority to maintain a balance in man power will be an increasing danger to the war effort.

The closest possible co-ordination of the resources and fighting strength of all Allied countries is being maintained, and to this end the United States is giving splendid leadership. Raw materials are pooled on an international basis and, where shortages exist, the materials are distributed equally among all Allied countries. The requirements for each battle area are determined by central boards, the supplies being sent forward to each area from whatever country can best supply the requirement. To countries fighting for a common cause, international boundary lines mean little. I hope, and believe, that they will continue to be less important in the future than in the past.

Recent news from the combat areas has been encouraging. We have all been thrilled at the meeting in North Africa of two of the commanders in chief of the Allied nations accompanied by their military and naval advisers. We all admire the courage of the two great leaders who held their meeting in a place that was enemy territory only a few weeks ago. If published reports that issued from the meeting do not tell us *when* the war will end, they tell us very definitely *how* it will end.

It seems to me that an unwarranted spirit of optimism is abroad, looking to an early end to the war. The history of the war to date tells of many masterly withdrawals on our side but of few spectacular victories. As President Roosevelt stated recently, "Last year, we stopped them. This year, we intend to advance." Even so, it must be apparent to all that in this mechanical war, long lines of supply present grave problems. Long lines of supply will be inevitable from now on. The great need at the moment is for ships and more ships, both naval and merchant, and for planes and more planes, both fighting and transport. We have built up vast armies, furnished with all the equipment required by modern

(*Concluded on page 256*)

POOR & COMPANY

RAILWAY EQUIPMENT

CHICAGO, ILLINOIS

THE TECHNOLOGY LOAN FUND BOARD

REPORT FOR THE YEAR 1942

Principal repayments exceeded new loans made, and by December 31 the total of notes paid off had exceeded the total of notes outstanding for the first time in the Fund's history. The data given below summarize the Fund's transactions during 1942 together with the cumulative figures for the past twelve years.

By year-end the Fund had made loans to 2,507 men of whom 1,142, or over 45%, had completely discharged their financial indebtedness. Moreover, many of the 1,142, and others as well, had taken advantage of the provision that "payments may be anticipated," for $59,886.63 of notes were paid off during 1942 *in advance of maturity.*

Such cooperation is particularly appreciated in these times because it has enabled the Loan Fund Board to continue to bear the cost of insurance protection on all outstanding obligations despite the markedly higher "war risk" premium rates occasioned by men in the military or naval services.

THE TECHNOLOGY LOAN FUND BOARD
K. T. Compton
H. S. Ford
B. A. Thresher
D. L. Rhind, *Secretary*
H. E. Lobdell, *Chairman*

Cambridge,
February 1, 1943

Cumulative Record of the Fund from its establishment in 1930 up to December 31, 1942, and the corresponding figures up to December 31, 1941, together with the net changes during 1942

ITEMS OF OUTGO	*At Dec. 31 1941*	*At Dec. 31 1942*	*Net Changes during 1942*
Number of men receiving loans	2394	2507	+113
Total amount loaned	$1,685,764.75	$1,807,788.75	+$122,024.00
Average per capita loan	$734.87	$746.05	+$11.18
ITEMS OF INCOME			
Number of men whose indebtedness has been completely discharged	923	1142	+219
Principal repayments *in advance*	$196,970.27	$256,856.90	+$59,886.63
Other principal repayments	582,853.95	681,583.57	+ 98,729.62
Total principal repayments	$779,824.22	$938,440.47	+$158,616.25
Total principal matured, considering "advance repayments" as matured when paid	$851,350.84	$998,929.46	+$147,578.62
Collection ratio, i.e. percentage of total maturities paid	**91.6%**	**93.9%**	**+2.3%**
Matured principal in arrears	$69,129.27	$58,091.64	−$11,037.63
Actual "written off" accounts	2,397.35*	2,397.35*	(*no change*)
Total maturities unpaid	$71,526.62	$60,488.99	−$11,037.63
Interest received	$137,163.53	$155,699.38	+$18,535.85
NOTES OUTSTANDING	$903,543.18	$866,950.93	−$36,592.25

* Of seven men, deceased prior to 1938 and not covered by insurance.

A Matter of . . .

TECHNOLOGY

No easy matter—this job of producing for War. It takes everything, but most of all it takes research—study—understanding—engineering. Diefendorf approaches every job as a specific problem, worthy of perfection.

DIEFENDORF GEAR CORP.

D. W. Diefendorf '30, President

Syracuse, New York

DIEFENDORF GEARS

William H. Coburn, '11 William F. Dean, '17

William H. Coburn & Co.

INVESTMENT COUNSEL

68 Devonshire St. Boston, Mass.

ENGINEERS IN WARTIME

(*Concluded from page 254*)

armies. We have ahead of us the task of building up transportation by sea and by air to meet all the many problems associated with adequate supplies for our fighting men. Our output of ships and airplanes is growing month by month, and growing rapidly. But the destructive power of the enemy submarine is as great as ever and continues to menace our lines of supply. The numbers of enemy submarines are increasing month by month, and each new batch is faster and better armed than the last. Losses of shipping continue at an appalling rate, and though new ship tonnage is now being built at a pace faster than tonnage is being sunk, the margin must be widened quickly and greatly to enable our growing armies abroad to have the needed support.

I therefore urge you, who are now entering on your active war duties, not to think of a quick and easy victory but to settle down to a long, hard struggle. You will not be faced with the frustration of defensive warfare which has been the lot of part of our Canadian Army that has already served abroad for more than three years, but I think you will have ample time to play a great part in this war to preserve civilization. I wish to every one of you a grand war career and a safe return to peacetime pursuits.

TOWARD THE MOUNTAIN

(*Continued from page 236*)

movements. Undoubtedly many surprises are in store for us — some unpleasant ones, perhaps, and many that we trust will bring satisfaction. I do not know how to predict or describe this region except to say that to traverse it successfully will require courage, sacrifice, and a high degree of intelligence in our actions. These qualities will have to be exhibited by us as individuals as well as by economic and political groups, such as cities, labor unions, farm blocs, industrial companies, regional groups, and the like. The same qualities will be required of our country as a whole in its public opinion and its leadership.

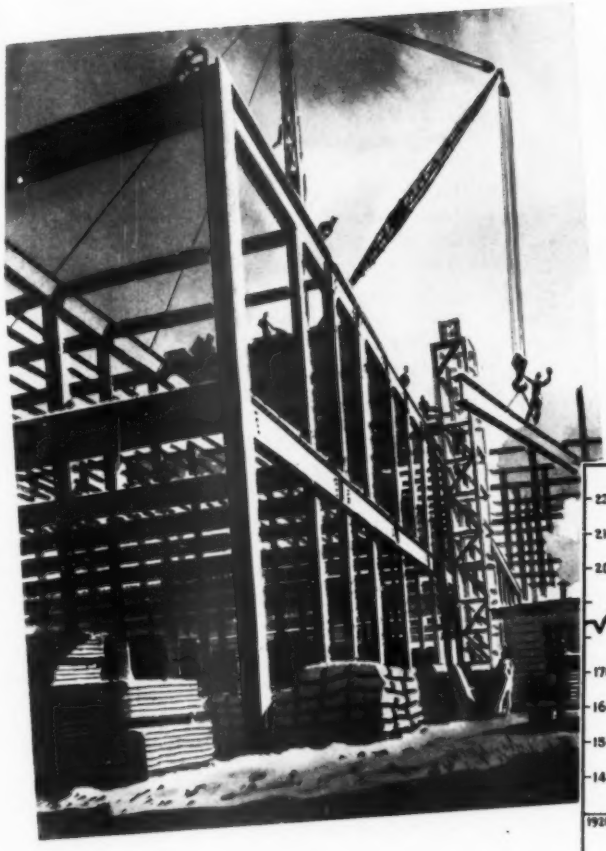
The first great obstacle between us and that glorious high mountain which is our desired goal is the war. We must win the war or we are doomed to struggle on and

(*Continued on page 258*)

DEECY PRODUCTS COMPANY

120 Potter Street, Cambridge, Mass.

President, Dudley Clapp, '10 Chief Chemist, J. Arthur Hansen, '34



COULD YOU REBUILD TODAY?

TO FIND THE REPLACEMENT COST OF YOUR BUILDINGS

In the table below select the year the building was erected or when the latest appraisal was made. Multiply the factor given by the cost or appraisal value as of that year. The result is approximate replacement cost as of Jan. 1, 1943.

1913 - 2.27	1918 - 1.43	1923 - 1.22	1928 - 1.21	1933 - 1.53	1938 - 1.15
1914 - 2.47	1919 - 1.43	1924 - 1.22	1929 - 1.19	1934 - 1.36	1939 - 1.15
1915 - 2.39	1920 - 1.10	1925 - 1.24	1930 - 1.23	1935 - 1.27	1940 - 1.12
1916 - 1.73	1921 - 1.37	1926 - 1.23	1931 - 1.34	1936 - 1.32	1941 - 1.07
1917 - 1.36	1922 - 1.46	1927 - 1.22	1932 - 1.61	1937 - 1.16	1942 - 1.02

Are you insured according to *today's* values?

Is your present insurance in step with the increase in general building and material costs?

These are questions which — for the security of your business — you should be able to check off with a "YES"! Adequate insurance is all the more important today because due to war shortages you may not be able to replace your plant at all! If you *can't* replace your plant or equipment, you'd certainly want the equivalent money-value. *Is that possible with your present insurance?*

Although the Factory Mutuals place greatest emphasis on what you want most — *the protection of your property from fire* — their strong loss-paying ability further safeguards plant investment when an unexpected disaster does occur.

If you haven't recently reviewed your insurable values, you'll find the above table of interest.

HOVEY T. FREEMAN, '16
President

NOTE: "Tech" men predominate in the more important positions of the individual companies that make up the Factory Mutual Group and of the jointly operated Inspection Department.

MANUFACTURERS MUTUAL FIRE INSURANCE COMPANY

10 WEYBOSSET STREET, PROVIDENCE, RHODE ISLAND

Over $15,000,000,000 Insurance in Force in the Factory Mutual Companies

TOWARD THE MOUNTAIN

(*Continued from page 256*)

on, caught in a depressed and gloomy valley of defeat. There is no point in any word to you either of warning or of exhortation on this matter. Though our nation had been drugged by two decades of wishful thinking, overconfidence, and shortsighted isolationism, we are now awake and at work. The surest test of morale is the spirit in which selfish desires are abandoned in order to achieve a higher, unselfish purpose. By that test our national morale is now quite good, better than it was six months ago, far better than it was before Pearl Harbor. The forces of work, sacrifice, and victory are today irresistibly on the march in America. To these forces, the Institute is contributing in many ways through its Alumni, its staff, its laboratories, and now soon through you. To struggle ahead through hardships with effective determination requires incentive and faith — an incentive strong enough to motivate the effort, and a faith that the goal of the struggle is possible to achieve. As far as the war is concerned, our incentive is preservation of ourselves and our ideals; and our faith that we shall win is sure.

Beyond the war lie further obstacles, some of which we can see, like the foothills, in dim but definite outline. One of these will be the peace arrangements, which will challenge the wisdom, the courage, and especially the unselfishness of all participating nations. Another will be the postwar financial readjustments, which will burden us with debt at a period when we shall no longer feel the wartime urge to Spartan sacrifice and virtue. Another will be the inevitable period of readjustment in employment, when the Army and Navy will be largely disbanded, the war industries closed down, and the peacetime industries not yet in full swing. These economic problems within the nation will again call for all the wisdom, courage, and unselfishness that we can muster individually and collectively.

In all these postwar readjustments, we shall doubtless make some mistakes, we shall doubtless have some failures, and we cannot hope to be free of some political demagogues, some business profiteers, some labor racketeers, some selfish pressure blocs, and some stupid leadership. We can only try to minimize such evils by continuing to run our affairs with the same type of courage, co-operation, and, where necessary, sacrifice which the war emergency is calling forth. Times of emergency have always brought out the best in us. The postwar era, like the war years, will be a period of emergency; we must not let down in our idealism or our determination to see things through to a satisfactory finish. Our great and tragic error 24 years ago was that we let down too soon.

An analogy comes to mind out of an experience my wife and I had when we were canoeing in the inadequately mapped lake region along the height of land between Lake Superior and Lake of the Woods. We had gone down a deep rapids between two perpendicular cliffs only to come out in a pond which was also rimmed with cliffs and had a raging waterfall for its sole outlet. Except by hazardous scaling of these 100-foot cliffs and hauling our canoe up by rope, the only escape was to paddle back up the rapids. This we tried, and by taxing our strength to the utmost, we reached smooth water at the head of the rapids. Being tired out, we relaxed our efforts. The smooth water, however, was deceptive — it was smooth, but it was swift — and the first thing we knew we were swept helplessly back down the rapids. Then we rested for about an hour to regain our full strength. We climbed a little way up the cliff to look upstream and plan an upward course that would take full advantage of the eddies and avoid the worst stretches. When we again worked upstream, we did not let up when we passed from the rough into the smooth water, but we kept on with all our might till we were far from the current. Then we landed, flopped for a while, and decided we had done enough that day.

In the last War, we quit paddling when the sound of firing ceased. We wanted to forget the struggle and sacrifice, and to take things the easy way. As a result we were again swept back into the turbulent river of war. Now we are paddling as hard as we can again to get back to peaceful waters. God grant that we may have learned our lesson so that this time we shall not be deceived when we reach smoother waters but shall have the wisdom and courage to keep on paddling until we are certain that we are safely free from the currents which can again plunge us into war.

But I am mixing my metaphors. I was taking you on a mountain-climbing trip and then shifted you into a canoe. So let us get back for a while to plain language.

You who are being graduated from this institution have a greater incentive than most to win the war, win the peace, and get on to your goal in life, because the fields in which you have chosen to secure training for your careers happen to be fields which will inevitably be rich in opportunity after the war. Let me illustrate by pointing out four factors in the situation.

(1) I do not believe that our government will dump ten million soldiers and sailors back into civil life to shift for themselves as soon as the war is over. Neither will the millions of employees in the war industries simply be thrown out of work. Such actions would create an unemployment and a political crisis that no government could stand. Therefore the government must plan to sponsor, directly or indirectly, some great program of useful employment to taper down the numbers mobilized for war and enable them to be absorbed into the ultimate normal business life of the country. The problem of publicly sponsored work will be not unlike that of the depression period 10 years ago but with two great advantages: First, the lessons and experiences of the last decade can guide us to make our next attempt a better one. Second, the war will have created an enormous reservoir of deficiencies in products and facilities which the man power of the nation can be mobilized to supply. The types of useful work thus to be done will of necessity include things principally of a technological character — buildings, housing, reconstructed railroads, highways, new civilian air transport facilities, ocean shipping, and so on.

(2) Industry will begin a tremendous job of retooling for production of civilian goods — the automobiles, radios, refrigerators, typewriters, civilian aircraft, car-

(*Concluded on page 260*)

ESTABLISHED 1818

Brooks Brothers,
CLOTHING,
Men's Furnishings, Hats & Shoes

MADISON AVENUE COR. FORTY-FOURTH STREET
NEW YORK

"IT PAYS TO BUY AT BROOKS BROTHERS"

It pays to buy moderately priced clothes in a store that also has earned the reputation for having the finest things money can buy. It pays especially at Brooks Brothers where the same taste, the same knowledge, the same executive staff that picks out the best woollens, shirtings, necktie silks, hats and shoes — the best of everything wearable that England, Scotland and America can produce — also personally specifies every detail in less expensive clothes.

At Brooks Brothers — no matter what you pay — you are sure that styles, materials and workmanship are right.

Ready-made Suits, $58 to $92
Sixth Floor Shop Suits, $43 to $55

Price List of Officers' Uniforms and Accessories on Request

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THE schools of Architecture, Engineering and Science, the Graduate School and the Division of Humanities offer instruction and opportunities for research, both undergraduate and graduate, in the following fields of study as well as in allied subjects:

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Aeronautical Engineering
Building Engineering and Construction
Business and Engineering Administration
Chemical Engineering
Civil and Sanitary Engineering
Electrical Engineering
General Engineering
Marine Transportation
Mechanical Engineering
Metallurgy
Naval Architecture and Marine Engineering

The Catalogue contains full information and will be sent gratis and post free upon request. All correspondence regarding admission either to undergraduate or graduate study should be addressed to the Director of Admissions, M.I.T., Cambridge, Mass.

TOWARD THE MOUNTAIN

(*Concluded from page 258*)

pets, and hundreds of other articles production of which was stopped during the war and for which a huge demand will have accumulated.

(3) To avoid danger of quick overproduction of old types of products, manufacturing concerns will bring entirely new types onto the market. A strong realization of the importance of technological progress was built up during the recent depression years; it was one of the good results of the depression. Now many companies as a consequence have new products or new plans on the shelf ready to develop and introduce to the public after the war.

(4) Most of the other nations of the earth will have suffered tremendous destruction of public works, transportation facilities, housing, and all kinds of products and facilities. To replace these things will be an enormous job in which our nation will have to take an important part. For some of this reconstruction, plans are already being drawn.

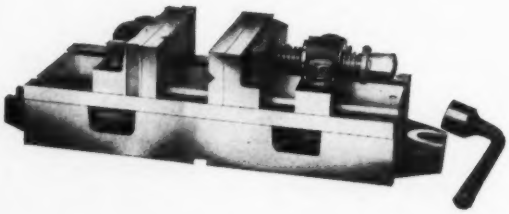
Every one of the great postwar reconstruction activities will require enormous numbers of architects, engineers, scientists, and administrators with technological backgrounds. All of them represent exactly the fields of specialized education to which Technology is dedicated. They represent exactly the fields in which you have secured your training. Consequently I believe that the inevitable course of events will find you at the types of work which you had planned to follow before the war intervened. Now that war is upon us, we must set to it and do the job of winning it, each in the manner which falls to his lot. Even in war jobs, the training and knowledge which you have gained at the Institute will stand you in good stead. And after the war, there will be professional work for you to do — plenty of it — unless we as a nation sadly mishandle the opportunities that will come to us.

Several years ago, in a late afternoon, I was on a ship traveling from Seattle toward Victoria on Puget Sound. It was a day of rare visibility, and we could see Mount Rainier, 120 miles away, looming high in the sky like a golden monument, with range on range of islands and foothills extending, dimly outlined, through the intervening reaches. So, I like to think, stands out the future of America, a golden future that is accessible to us if we have the skill and courage to navigate the intervening islands and surmount the foothills.

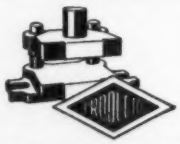
As you of the Class of 1943 start on this journey, with such supplies as we have been able to provide you, we bid you have faith and courage. We who are older are trying to make the journey with you. Some of us will get only part way and perhaps none of us will reach the top of the mountain, but the way is full of interesting, if difficult, adventure and every foothill surmounted will justify the effort. As you enter the next stage of your journey, we wish you safety, if God will, and that inner satisfaction which is the reward of sincere effort in a good cause.

. . . MANUFACTURERS OF . . .

Die Sets for Power Presses
Accessories for Tool and Die Makers
Modern Machine Vises for Machine Tools



THE PRODUCTO MACHINE COMPANY

Bridgeport  Connecticut

N. M. Marsilius '17 *Branch Office:* Detroit, Michigan

Webster Single Slip Type Expansion Joint, Crosshead Guided.

Serving America at War

Expansion Joints

For today's far flung military and naval air bases, refueling installations, extended army cantonment hospitals and war production plants, Webster makes a simplified line of cast iron Expansion Joints—designed to save critical materials and machine time. Limited to most widely used pipe sizes. Available in single slip or double slip, with 4" or 8" traverse per slip. Standard weight models are provided for maximum operating pressure of 125 lbs. per sq. in. The maximum operating temperature is 450 degrees F. Regular packing is for steam and water. Special packing can be provided for hot oil and hot gas. Webster Internally Guided Cast Iron Expansion Joints are described in Bulletin B-1103A. Webster Crosshead Guided Expansion Joints, fully meeting specifications calling for both internally and externally guided cast iron type, are described in Bulletin B-1101A. Ask for bulletins by number.

Keep your present Webster Equipment in first-class condition—add years of life to your heating system—by following the practical heating advice in Webster Service Bulletin S-500-E. A copy is yours for the asking.

WARREN WEBSTER & COMPANY
CAMDEN, N. J., EST. 1888, PIONEERS OF VACUUM STEAM HEATING

A MIGHTY flood of "Chicago pianos"...

Fire-power to engulf the Axis . . .

Machine guns by the million . . .

That is America's promise to the Victory Program—and America is going to beat that promise.

The time-table of war construction has been reviewed in order to get essential new plants into production without delay.

Heating problems presented by plant conversion and by the new building program call for a proven method of heat distribution.

When steam is selected as the heating medium, all of the experimenting has been done. Steam harnessed and brought under control with Webster Systems of Steam Heating has proved its ability to heat every section of a building to the desired temperature at minimum cost.

Today, we are engaged in direct war work, but manufacturing facilities are still available to supply Webster Steam Heating Equipment for buildings serving the war effort.

Essential repairs for Webster Systems are available on A-10 priority, under W.P.B. Emergency Repair Order P-84. Orders should be limited to actual needs.

Warren Webster & Company, Camden, N. J.
Representatives in 60 principal Cities

Webster
Steam Heating

This is one of a series of advertisements that tells the public of the part that Webster Steam Heating and the Webster organization plays in the war effort . . . appearing regularly in leading business, industrial, engineering and technical publications.

SCIENTIFIC MAN POWER

(*Continued from page 238*)

of workers, whether skilled or unskilled, to transfer from their peacetime occupations to work made essential by the war and to acquire those skills which war needs demand.

It is exactly this result that is being accomplished, to an extent greater than the layman is aware of, in the field of science. By means of intensive transitional courses, mature scientists are being trained and transferred from one engineering field to another. The civil engineer, for example, whose work has been the structural design of skyscrapers, bridges, and highways, has a fundamental knowledge which enables him to turn quickly to the solution of problems in aeronautical engineering, automotive engineering, or shipbuilding. The knowledge of the biologist, the chemist, the physicist, and the mechanical engineer becomes, under special training, of great value in problems of food processing.

On a national scale much of this intensive training of technical experts is being administered by a division of the United States Office of Education known as the Engineering Science and Management War Training Program. With this program the Institute has effectively co-operated. Indeed, I know that you have retrained some of your own graduates to return to the Institute as teachers and researchers in fields of wartime importance.

Yes, unquestionably the tragic demands of war have accelerated the progress of science. As we have seen, war has accelerated the training of scientific man power, stimulated research beyond all former bounds, and revealed to us the adaptability of our scientists. Under the stress of war a degree of scientific co-operation hitherto unknown has come into being. Here at the Institute at this moment are men on leaves of absence from 73 educational institutions and 43 industrial organizations, working together in what can only be described as a national undertaking of American colleges, universities, and industry. This is indeed scientific man power at war. And scientific man power is having its effect, every day, directly on the enemy. Once again, details cannot be gone into, but equipment designed at the Institute is being used in successful operations against the enemy even as we are gathered, and it is being produced in ever larger quantities for the armed services to use in carrying the fight ever closer to the enemy's home bases.

Yes, this is war.

And though the road to victory may be long and we know that it will be hard, we shall win.

And then there will be the peace.

Is there anyone who has ever supposed for an instant, or who has ever been sufficiently deluded to imagine, in the midst of wartime pressure, that with the peace would come a lessened demand for scientific and engineering skills? You do not need me to tell you, I think,

(*Continued on page 264*)

NATIONAL ELECTRIC
REFRIGERATOR LTD.

P.O. Box 224 • Phone 207

MONTMAGNY, QUEBEC
CANADA

ADRIEN J. COLLIN, '33, MANAGER

Manufacturers of Aircraft Parts

Third floor back...

● It's 4 p.m. on a quiet street.

A slip of a girl, with a suitcase a little too heavy for her, climbs the brownstone steps and rings the bell.

Her heart is beating fast, but it's not from the weight of the suitcase.

She's wondering what it will be like, in a furnished room, so far from home.

She's hoping she'll make good at her new job.

She's thinking that maybe now she understands a little bit of what Tom must have felt when he said goodbye and left for camp.

But she's not going back till it's over.

Millions of men and women today are finding themselves in strange surroundings—in situations they couldn't have imagined a few years ago. They are giving up their pleasures and comforts—and often much more—to bring future good to the whole world. And they don't mind—too much—because it will be worth it.

Industry, too, has put aside for the duration its never-ending job of supplying those pleasures and comforts which have helped to make life fuller and better in America than anywhere else in the world. Industry is working today with strange new materials, toward grimmer goals—but working with the *same ingenuity and skill, organization and experience, initiative and resourcefulness*. For these things are as much a part of American industry as they are of Americans.

And because they are, we have not found today's production task, big as it is, too big. Because they are, we shall not find tomorrow's challenge, great as it will be, too great. With new materials like plastics, new sciences like electronics, offering hope and fuller opportunity; but with the old American ingenuity and courage and enterprise—we shall face the task of building a better world. General Electric Co., Schenectady, N. Y.

★ ★ ★

The volume of General Electric war production is so high and the degree of secrecy required is so great that we can tell you little about it now. When it can be told completely we believe that the story of industry's developments during the war years will make one of the most fascinating chapters in the history of human progress.

GENERAL ELECTRIC

952-456C-211

SCIENTIFIC MAN POWER

(*Continued from page 262*)

that the entire world will be calling on you to restore the ravages of war. If it is true that scientists and engineers are inspired in looking ahead, if it is true that they find their greatest stimulation in the sight of problems which they feel themselves competent to solve, then I can imagine no group with greater cause for inspiration and stimulation than you graduates.

None of us can say for certain now in precisely what form the world will exist, or even should exist, after this war. Prophecy is not the most practical of pastimes. And yet each of us has his or her hopes for the future, his or her ideas of what kind of a place the world might be made to be. Whatever the world is to be like, this institution and the other technological institutions of America will have magnificent opportunities in the years of reconstruction. At the time of the founding of the M.I.T., Americans who wished to acquire specialized knowledge in graduate courses were forced to study abroad.

Since that time, however, the American technical school has become as indigenous as the American liberal college, whose total preservation in these days of crisis is a matter of the deepest concern to all of us. The American technical school has attracted students from all over the world. The student body and the Alumni of the Institute alone include persons from 81 countries. One of your largest groups of foreign students has long been the Chinese. The scholastic record of your Chinese students has consistently been the highest for any group in the Institute. The studies pursued by these men at Technology, over the years, form an interesting pattern.

Formerly they concentrated upon civil engineering — principally highway construction and flood control. Then their emphasis shifted to electrical engineering. Five or six years ago, for reasons only too well known to all of us, they began to study aeronautical engineering. At present, their activities are divided among these three fields. When the war is won, is there any doubt that new gifted students from China will come to acquire the techniques necessary for the rebuilding of their ravaged land? Nor is there any doubt, I think, that in the new world which will follow the peace, China will have technological institutes of her own.

Our Latin American neighbors, nearer at hand, are sending ever increasing numbers of students to achieve that mastery over the forces of nature which will result in closer ties and increased mutual knowledge and understanding. The war has kept at home the fine students who formerly came to this Institute from Russia. But the results of the training which they followed here — their studies in aeronautical engineering, for example — are apparent in the victories being won these very days on Russian soil and in the Russian air. Recently you have added the study of the Russian language to your curriculum, where it now stands with French, German,

(*Continued on page 266*)

Humidity—Saboteur

WITH the stern certainty of Time, Humidity the Saboteur will slow down vital War processes during the summer months.

To you men whose job it is to keep production up to quota, the damages and delays caused by high humidities are well known. Now, more than ever before, it is your responsibility to prevent Humidity Sabotage.

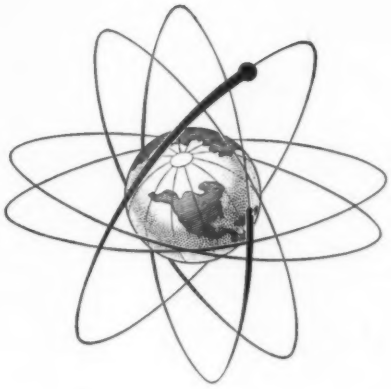
Humidity can be controlled.

Prevent waste of precious time and materials by being ready to stop this saboteur when he strikes your plant this summer.

The experience of our Engineers is yours to show you the best method of Humidity Control for your process, and handle every detail of installation.

HAROLD J. RYAN, INC.

101 Park Avenue, New York City



If I were an Engineer...

. . . I WOULD PAUSE *TODAY* TO EXAMINE THE OPPORTUNITIES of my profession and the nature of my own work in relation to the swiftly moving drama of these stirring times.

And I would ask myself how I could contribute to the war effort and, at the same time, build a foundation for a *secure future after the war.*

This is the kind of opportunity the International Resistance Company offers to engineers with experience in the design, development and/or manufacture of small component parts in the electro-mechanical field.

★ ★ ★

Today, IRC has world-wide recognition in the production of fixed and variable resistance devices. While the war lasts, our expanded production will continue to be earmarked for the Armed Services and for industry serving the war effort. But, after the war, the field of electronics with its innumerable applications to post-war living will demand many new developments. Both now and for the future we plan to expand our permanent engineering staff.

Here at IRC you'll find a sound organization with standards of workmanship which have earned for IRC products a position of leadership in their special field. . . . You'll be working with a forward-looking management group, in association with friendly and earnest people. . . . You'll be busy today and secure tomorrow!

If you have had the experience we are seeking and you're not now employed at your highest skill in war production work, we shall welcome word from you giving us the customary professional, business and personal data for careful *and confidential* evaluation.

Or . . . should you not be free to act upon this suggestion, you may have friends and acquaintances who are. Won't you tell them, please? We'll be grateful, and they may be interested for themselves or others.

PREFERRED FOR PERFORMANCE ★ IRC ★ FIXED & VARIABLE RESISTORS

INTERNATIONAL RESISTANCE COMPANY

423 N. BROAD ST., PHILADELPHIA

SCIENTIFIC MAN POWER

(*Continued from page 264*)

and Spanish. Is it too much to hope that the end of the war will find a pool of technically trained Americans, Americans specially trained also in the languages, traditions, and backgrounds of foreign countries, who will be available for undertaking the most instantly pressing needs of postwar reconstruction abroad? That, it seems to me, is a goal to aim at.

And do not think, when I talk about the work which will be waiting to be done after the peace, that I do not mean our own country is to be included. We shall continue, please God, to be spared the ravagings which have been visited upon other lands. Despite that probable immunity, however, and despite our much vaunted "high American standard of living" — which we hope, indeed, will become still higher and become the world's standard of living — you and I know that even this country has never had enough of the useful and desirable things which science and engineering can bring into being.

Recent floods on the Ohio and on the eastern and western rivers have shown us how fruitful can be the results of flood control — but also they have shown us how much more remains to be done. If employment is to be provided at all times for our citizens, new industries will be needed. Large areas must be protected not only against flood but also against drought and against soil erosion.

Our methods of transportation and distribution, even apart from the wear and tear which they will have suffered from the strain of war, are far from being incapable of improvement. The discovery of new industrial uses for agricultural products is in its infancy. And the provision of decent housing facilities for the masses of our population can scarcely be said even to have been born. Every one of these great home problems is a challenge to the engineer and the scientist who have a sense of social responsibility.

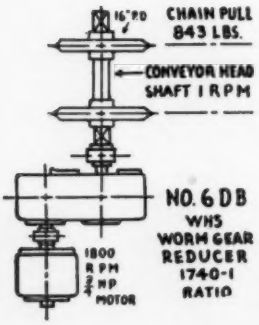
For the most part, the limit of our national resources is known; the end of some of them is definitely in sight. Hence, conservation of the resources yet remaining becomes of critical urgency. This, in turn, demands the most thrifty use of those resources which are exhaustible, the most provident possible use of those which may be perpetuated, and the never ceasing search for substitutes. For all of these ends, ever finer techniques are demanded. Such techniques are objectives of you graduates of 1943.

Above all, when peace does come, let us not lose those gains in American life which, as we have seen, it has taken the tragedy of war to bring to us — particularly that hard-won spirit of co-operation which, in the very midst of war, has brought educational staffs into closer contact with each other as well as with industry and with the agencies of government, which has promoted cross-fertilization among many different fields and among many fine minds from different back-

(*Concluded on page 268*)

When to Consider TORQUE LOAD instead of INPUT HORSEPOWER in a SPEED REDUCER

LARGE REDUCTIONS . . . to accommodate low final speeds . . . call for consideration of torque load rather than input horsepower. The theoretical H.P. required, for instance, to drive the slow-moving conveyor installation shown at left, is unbelievably small. It is a common experience to find such installations *over-motored.*



This and other problems are discussed and solutions given in our Engineering Service Bulletin, "Torque versus Horsepower." Certainly you may have a copy. Just drop us a line.

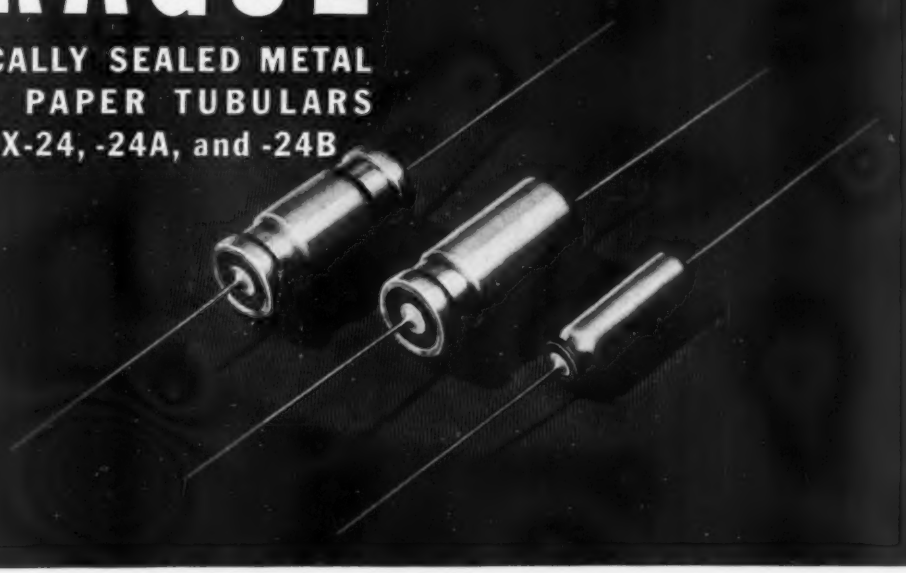
Cutter P. Davis, M.I.T. '19, President

No. 6 DB
WHS Speed Reducer

WINFIELD H. SMITH, Inc.
55 MAY STREET . . . SPRINGVILLE . . ERIE COUNTY . . NEW YORK

SPRAGUE

HERMETICALLY SEALED METAL ENCASED PAPER TUBULARS
TYPES PX-24, -24A, and -24B



BUILT TO DO MICA CAPACITOR JOBS

. . . and do them well!

SMALL—light in weight—hermetically sealed, and outstandingly sturdy, these Sprague Metal-Encased Paper Tubular Capacitors have proved eminently satisfactory for numerous blocking and by-pass applications previously assigned exclusively to molded mica units. Not only is this true as regards less critical "mica jobs," but also on more exacting applications where characteristics such as temperature-insulation resistance, voltage-capacitance, or temperature-capacitance are important considerations.

There remain, of course, certain applications where mica capacitors should still be used, and Sprague regularly produces large quantities of transmitting mica capacitors in a complete range of types and sizes.

Deliveries of both types are obviously dependent on prevailing priorities. Production facilities—especially on the Metal-Encased Paper units—are being steadily expanded, and Sprague engineers will gladly cooperate in determining the adaptability of these Capacitors to your requirements.

SPRAGUE SPECIALTIES COMPANY
North Adams, Mass.

MATERIALS WANTED!

Sprague offers a constant market for large quantities of critical materials. Present requirements include: 7/16" and 1/4" hex brass rod, free turning; 5/16" and 1/4" diameter brass rod, free turning; #22 gauge long ternes, 8# to 15# coating; 8/32" standard hex brass nuts; also ferrous and non-ferrous metals. Offers of these items in small lots or large will be reported upon promptly and AA1 Priorities supplied to cover purchases.

F. W. McNAMARA, Purchasing Agent
Telephone: North Adams (Mass.) 804

MANUFACTURERS OF A COMPLETE LINE OF RADIO INDUSTRIAL CAPACITORS AND KOOLOHM RESISTORS

SCIENTIFIC MAN POWER

(*Concluded from page 266*)

grounds, and which, if preserved, will result in more and more graduates of such institutions as this entering the public service of the cities, the states, and the nation.

You who are being graduated from the Institute have had the privilege of spending close to four years in an atmosphere of the purest and most unbounded co-operation. Under a single roof, the many Departments of study and instruction are unified into one great co-operative enterprise by teachers and students from every state in the Union and almost every country in the world.

Unlike the frontiers of nations, those of science have long since been obliterated by goings and comings across the borders. There are no guards, no immigration officers. The only customs requirements are enthusiasm and a willingness to exchange thought and technique. Scientists seek intelligently and co-operatively to understand themselves and the world in which they live, with the object of gaining systematic control of the hidden forces of nature for the further progress of civilization and human society.

Through diffusing this spirit of unity and co-operation which you have acquired in your years of study, no less than through your more material accomplishments, you will perform your vast service to this country and to the world.

NOT WORK, PRODUCTION

(*Continued from page 240*)

history, particularly with emphasis upon social and economic affairs, might help us avoid repeating so often the mistakes of the past.

In one way at least I think science may have contributed to the prevailing confusion of thought. Science and technology have produced such a number of complicated things by methods which to the uninitiated are so obscure, and the popular acclaim accorded to scientific achievement is so abject, that we have tended to the opinion that nothing is simple. We have befuddled ourselves no end, and nowhere, it seems to me, is confusion more confounded than in some of our current ideas on economics.

Consider for a moment the subject of money. Most people, if closely questioned, would probably admit they do not understand much about money except that it is nice to have, hard to get, and almost impossible to keep. In fact, our respect as a nation for our own ignorance about money is so profound that we countenance preposterous absurdities! For almost 10 years now we have by legislative fiat made it illegal for any individual to own gold. Meanwhile, equally arbitrarily we announced to the world that gold, previously evaluated by us as worth $20 an ounce, would thenceforth be valued at $35 an ounce. We invited everyone all over the world to ship it to us, and at this inflated value we per-

(*Continued on page 270*)

Owned, Officered and Manned by New Englanders

Boston
INSURANCE COMPANY

Incorporated 1873

For 70 years this Company has rendered unfailing service to the public — from insuring clipper ships to vast industrial plants and civilian properties throughout the country.

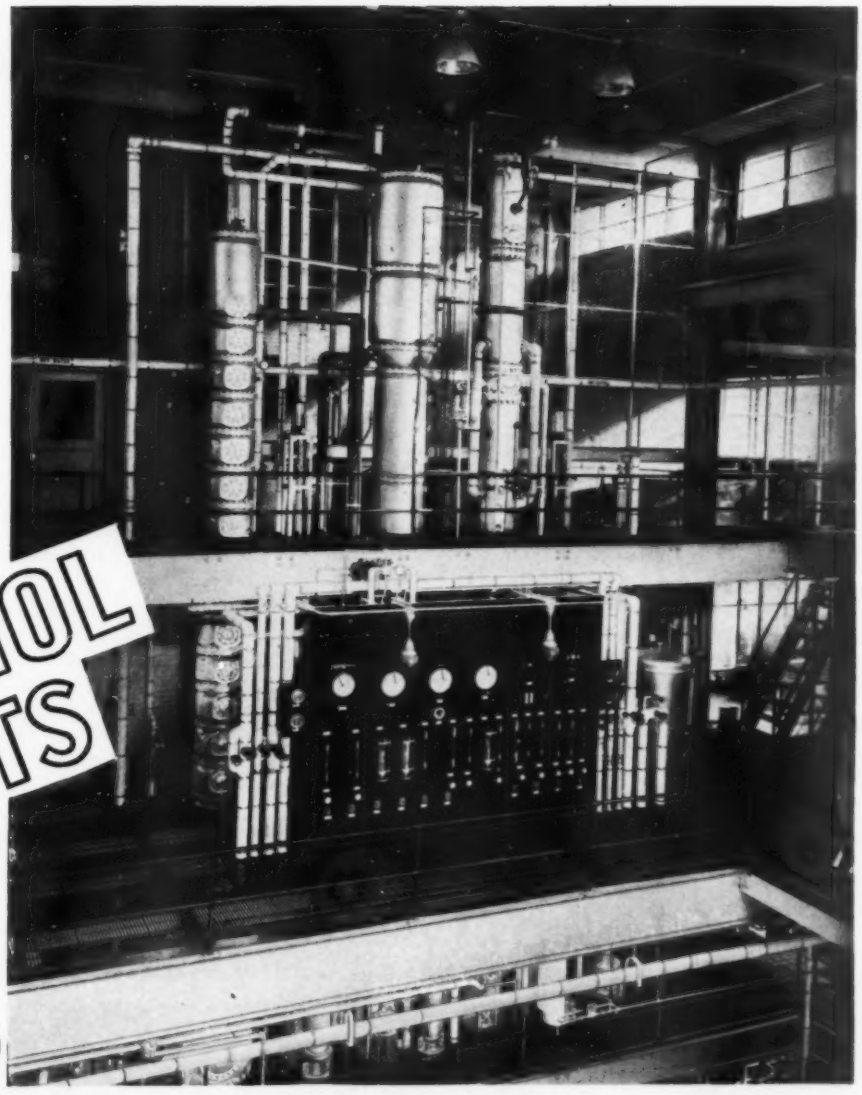
Old Colony
INSURANCE COMPANY

Incorporated 1906

The emblem of the Mayflower signifies the essential integrity of the Company's New England background. Through the years, it has maintained unassailable financial strength.

Home Office: 87 Kilby Street, Boston, Massachusetts

WILLIAM R. HEDGE, '96, *President*
HENRY R. HEDGE, '96, *Vice-President*



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DISTILLATION-EVAPORATION-EXTRACTION

PROCESSES AND EQUIPMENT

The VULCAN COPPER & SUPPLY CO.. Cincinnati. Ohio

NOT WORK, PRODUCTION

(*Continued from page 268*)

mitted them to buy with it anything for sale in this country! And did they ship it to us! We got about two-thirds of all the gold there is. Men everywhere feverishly dug holes in the ground wherever gold might be found and sent it to us by the ton. What did we do with it? We dug another hole in the ground in Kentucky and buried it! Does that make sense in anybody's language?

There is the story of the lady passenger, talking to the pilot and admiring his skill, who remarked that he must know where all the rocks were. He replied, "No, lady, I do not know where they are; I know where they ain't!" I think that if some of the methods of inquiry and research applied by M.I.T. in the fields of engineering and science were devoted to the study of money, we might soon find some clear sailing and arrive at the conclusion that it was not smart to dig gold out of a hole in the ground in one part of the world and bury it in another hole in the ground in another part of the world, meanwhile giving any foreigner who shipped it to us a fancy price for it in our paper currency and making it a crime for any United States citizen to own gold!

That is not the only funny story I could tell you about fancy economic problems. It is amusing, but it is pathetic, the amount of harm such economic voodooism can do to the processes by which men exchange their goods and services with each other. We must not allow such loose thinking to take root in this country. When the war is over, ten million men want jobs in our commerce and industry. You men of '43 will want opportunities for useful work for which you have so well fitted yourselves. What are the problems that confront us?

We hear a lot today about the "right to work." What about the responsibility to produce? There is no inherent virtue in work. The less of it the better. It is production we want, with its benefits fairly and equitably distributed. If it is only work for everybody which this country wants, I can give an infallible recipe for it right here and now. Just issue and enforce a decree that from now on no metal plow shall scratch the soil. Return to the primitive agriculture of the Egyptian fellah and plow with a crooked stick. There will be work for everyone. And such work. And such a standard of living! Something less than that of the fellah. Our soil is not so rich as the Nile Valley. We shall have no unemployment. Work will not be a right, it will be a necessity. But like all such schemes — and in recent years we have tried no end of them inherently just as ridiculous — the cure would be worse than the disease.

When this war is over, there will be no question of the necessity for work. Our need and the demand for all the things we are now going without will be insistent. We have the raw-material resources, the vast factories, and the complicated tools required to satisfy our demands. We have a great population of men and women trained and skilled in industrial work. All the ingredients are here. The questions which will arise will relate to the freedom to work — freedom from the enervating re-

(*Continued on page 272*)

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President

R. H. PRICE, '21
Director of Research, Texas City, Texas

GEORGE KOHFELDT, '25
Engineering Dept., Texas City, Texas

P. E. DARLING, '27
Chief Engineer, Texas City, Texas

J. B. HAMBLEN, '27
Hydro-forming Operations, Texas City, Tex.

WILLIAM KAPLAN, '27
Research Laboratory, Texas City, Texas

L. W. MOORE, '33
Manufacturing Dept., New York, N. Y.

C. F. FEUCHTER, '34
Manufacturing Dept., New York, N. Y.

***I. MAYER, '38**
Research Laboratory, Texas City, Texas

***E. J. STANTON, '41**
Research Laboratory, Texas City, Texas

Salute to Alma Mater

When Ralph Waldo Emerson said, "An institution is the lengthened shadow of a man," he did not need to add that where there is a shadow, there is also a light. And the light, its source and its power, are the schooling and training of the man.

So . . . this salute to M.I.T. . . which played so important a role and contributed so much to the scientific standing of this company.

AMERICAN AMOCO OIL COMPANY

AMERICAN AMOCO GAS

**On Military Leave of Absence*

NOT WORK, PRODUCTION

(*Continued from page 270*)

straints of stupid political bureaucratic regulations; freedom from the barriers of tariffs and quotas; freedom from the fears that shake men's faith in the future when they see continuing, year after year, national budgetary deficits leading to stupendous debts; freedom to pay or not to pay dues to a union of one's own choosing without coercion by employers, government boards, or one's fellow employees; freedom from the necessity for paying tribute to racketeers; freedom to go into business for one's self without burdensome red tape and restrictions; freedom to finance business without paying prohibitive legal fees to conform to harsh and obscure regulations.

I believe in the right of free men to organize into groups and, under leaders of their own choosing, to make all proper arrangements for the promotion and protection of their own legitimate interests. I don't think great industries can deal with tens of thousands of men on the same simple basis on which the old mill owner dealt with a few hundred. It is a disgrace to American industry that in their dealings with their employees certain employers have at times resorted to practices which made it seem advisable to give specific statutory recognition to the obvious rights of labor.

Under the aegis of laws designed to serve legitimate purposes, however, abuses have grown up in the practices of some labor organizations and on the part of certain labor organizers. These abuses are just as much against the public interest and just as effective conspiracies in restraint of trade as are to be found in the history of industry. The correction of such restraints of trade is equally vital to American labor, American management, American investors, and the American public. We must correct this situation if our progress is to continue; unless we do, a revulsion of popular feeling may well be engendered which will sweep out the good with the bad. It is all very well to talk about the "right to work," but it is all utter nonsense without "freedom to work" and "responsibility to produce."

Let's examine this mighty shibboleth, "the right to work," and see what it really means. In the minds of many, the analysis would run like this: Right to work? Surely everyone should have the right to work! Where do jobs come from? Industry hires men, gives them jobs. A soldier returning from the war can't find a job? Then industry must be denying him his fundamental and inalienable rights — the right to work, the right to have and raise his little family, the right to feel a security in his old age, the right to freedom from fear of unemployment and sickness! Who is denying these rights? Industry refuses to accept this responsibility? Down with the selfish tyrants. Destroy the greedy exploiters of the working man! Pass a law about that!

Such is the stuff of demagoguery. I leave to your own surmise the motives of the people who practice it. What are the facts? There is not time to weave the pattern of the millennium or even such a small portion of it as is involved in the development of those conditions which would assure every honest, industrious man the op-

(*Continued on page 274*)

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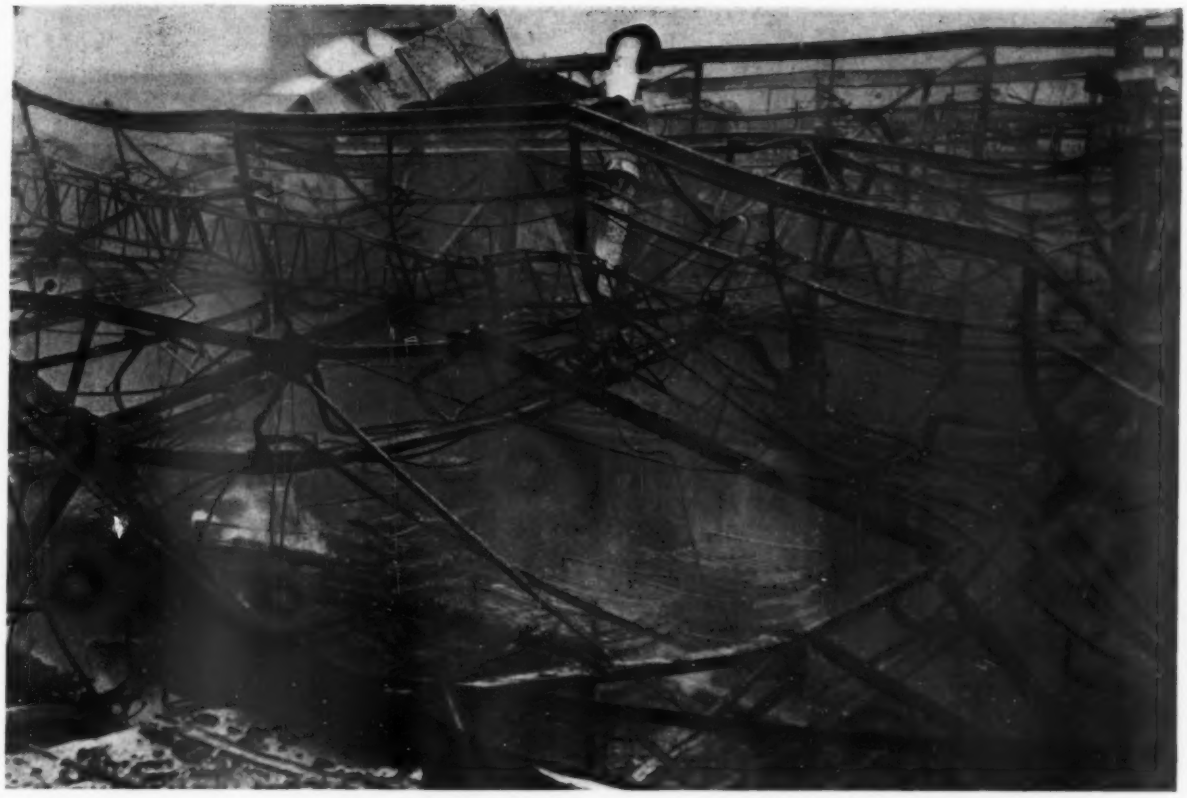

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Until the Fire . . THIS PLANT PRODUCED AIRPLANE CASTINGS

GOOD fire-safety engineering would have confined the blaze to a small area at the start . . . and the owner could have continued his contribution to war production and victory.

Instead, all production was halted. In the mistaken belief that a serious fire could not occur because "there was nothing to burn but the roof", sprinklers had not been installed, fire walls had not been provided.

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Last year, this group kept their average fire losses below $200 for each $1,000,000 of insurance — a greater degree of security than that enjoyed by any other important group of manufacturers.

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New York

ELTON E. STAPLES, '26
District Manager
205 W. Wacker Drive
Chicago, Ill.

NOT WORK, PRODUCTION

(*Continued from page 272*)

portunity to make his living, but I should like to ask a few simple questions. Have you ever met or can you imagine an employer, large or small, commercial or industrial, who wouldn't hire more men any time he saw an opportunity to sell the product of their labor at a profit and had the capital to buy the material and provide the facilities with which to employ them? I never have. Free men living under an economy of free enterprise create their own opportunities for employment. Scientific research creates new products upon which new industries are founded, offering new avenues for the investment of savings and new fields for the employment of labor. This system has worked, and it will work again if freedom is restored and the ingenuity of our people again given a chance to express itself. The alternative offered us is a planned economy, so called, under which we are now living as a result of the exigencies of war. Our civilian standards of life deteriorate by the day. The obvious inefficiency of bureaucratic management and the irritation of the regulations imposed upon us would be intolerable except as the price of victory.

Plenty of historical instances, past and current, can be found to show the results of governmental interferences of one kind and another with the processes of trade and industry. Specifically excepting those regulations honestly and intelligently dealing with matters of health and safety, no single instance of governmental action designed to accomplish an *economic* improvement has, in my opinion, ultimately proved to be beneficial in its results. On the other hand, we have the example of the long-term progress of our own great country under a system of private property and free enterprise as formerly practiced. We do not have such a system any longer. If we want it again, we will have to win it back.

Let us look about and see what current conditions really are now, realizing as we do so the great difficulty always experienced in throwing off in the future those shackles in which politicians have acquired a vested interest: Government today prescribes the terms and conditions under which we can raise capital by selling securities or borrowing money, the prices we pay for the raw materials we need, the wages we pay labor, the hours and terms under which labor may be employed, and the prices at which we may sell our products. It is now seriously proposing to tell each individual man the kind of work he may do and the place at which he must work. If we do not obey the rules, we are no longer tried in a court of law by a jury of our peers. We have our ration cards taken away from us! Without any due process of law, we can now be deprived of our means of travel. It is not a far cry to being deprived of our ability to get something to eat! To all this we gladly and cheerfully submit to win the war, but as a peacetime regime it could be described only as tyranny.

Thus we find ourselves in a world of turmoil, battling in foreign lands against forces of evil which deny the validity of those ideals of freedom and that dignity of the individual we hold most dear. There is no sacrifice

(*Concluded on page 276*)

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Our extra quality sash cord, distinguished at a glance by our trade-mark, the colored spots. Especially well known as the most durable material for hanging windows, for which use it has been specified by architects for nearly half a century.

NOT WORK, PRODUCTION

(*Concluded from page 274*)

of blood or treasure we will not cheerfully make to assure victory. Our factories, our schools, our whole resources are diverted to the one end of victory. No one of us would have it otherwise. But when we hear post-war planners say that these wartime governmental controls will have to be carried over if we are to solve our reconstruction problems, let us stop, look, and listen to the voices of our pioneer ancestors! We can all concur in the belief that our political, social, and economic objectives are the improvement of the lot of the common man. We are all just common men in the sense that we seek for ourselves no special privilege other than that greatest privilege which man has as yet attained — the privilege as free men to work out our individual destinies under laws that preserve for us those rights enumerated 167 years ago in our Declaration of Independence and subsequently provided for in the Constitution of the United States. This pattern, this principle, must be preserved.

Men of science and institutions of the character of M.I.T. have always been against reactionary authoritarianism whenever and wherever it has been found. We still are and always will be. You younger men who are fit are going forth to fight for the security of our heritage of freedom. On your success, on your victory, hangs not only the security of our country but the hope of free men the world over. You cannot fail. God bless you.

THE INSTITUTE GAZETTE

(*Continued from page 248*)

School and was graduated from Harvard College in 1906 and from Harvard Law School in 1908. He was admitted to the Massachusetts bar in the same year.

Mr. Ketchum is a director of the New England Trust Company, the Boston and Albany Railroad Company, Samuel Cabot, Inc., and the Wyman-Gordon Company. He is a trustee of the Massachusetts General Hospital and of the United Nations Relief Fund.

To the Polls

ELECTION of officers and representatives of Technology Alumni will soon take place; the more than 30,000 constituents of the Alumni Association will soon receive annual ballots. The slate this year presented by the National Nominating Committee — Charles E Locke, '96, acting chairman, Charles A. Smith, '99, Frederick D. Murdock, '13, Charles P. Fiske, '14, Stanley W. Hyde, '17, Sherry O'Brien, '17, Edward E. Scofield, '19, Winter Dean, '21, George W. Spaulding, '21, and Kenneth M. Cunningham, '22 — is headed by Francis J. Chesterman, '05, VI, the Bell Telephone Company of Pennsylvania, Philadelphia, nominee for the presidency of the Association.

For Vice-president the nominee is Raymond H. Blanchard, '17, X, Hood Rubber Company, Watertown; and for members of the Executive Committee, James A.

(*Continued on page 278*)

Salute TO THE
MEN AND WOMEN OF THE
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THE AWARD of the Army-Navy "E" to the men and women of the Converse Rubber Company in a citation from Under-Secretary of War Robert Patterson — ". . . for fine achievement in the production of war equipment..."—brings deserved recognition to a splendid army of workers.

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WHERE
Printing
IS STILL A CRAFT

THE INSTITUTE GAZETTE

(*Continued from page 276*)

Cushman, '03, I, New England Power Service Company, Boston, and Alf K. Berle, '27, XV, United Shoe Machinery Corporation, Boston, have been nominated.

Irving W. Wilson, '11, XIV, Aluminum Company of America, Pittsburgh; Walter J. Beadle, '17, II, E. I. du Pont de Nemours and Company, Wilmington, Del.; Donald F. Carpenter, '22, IX-B, Remington Arms Company, Inc., Bridgeport, Conn.; and Francis A. Barrett, '24, VI, New England Telephone and Telegraph Company, Boston, are nominees for term membership on the Institute Corporation.

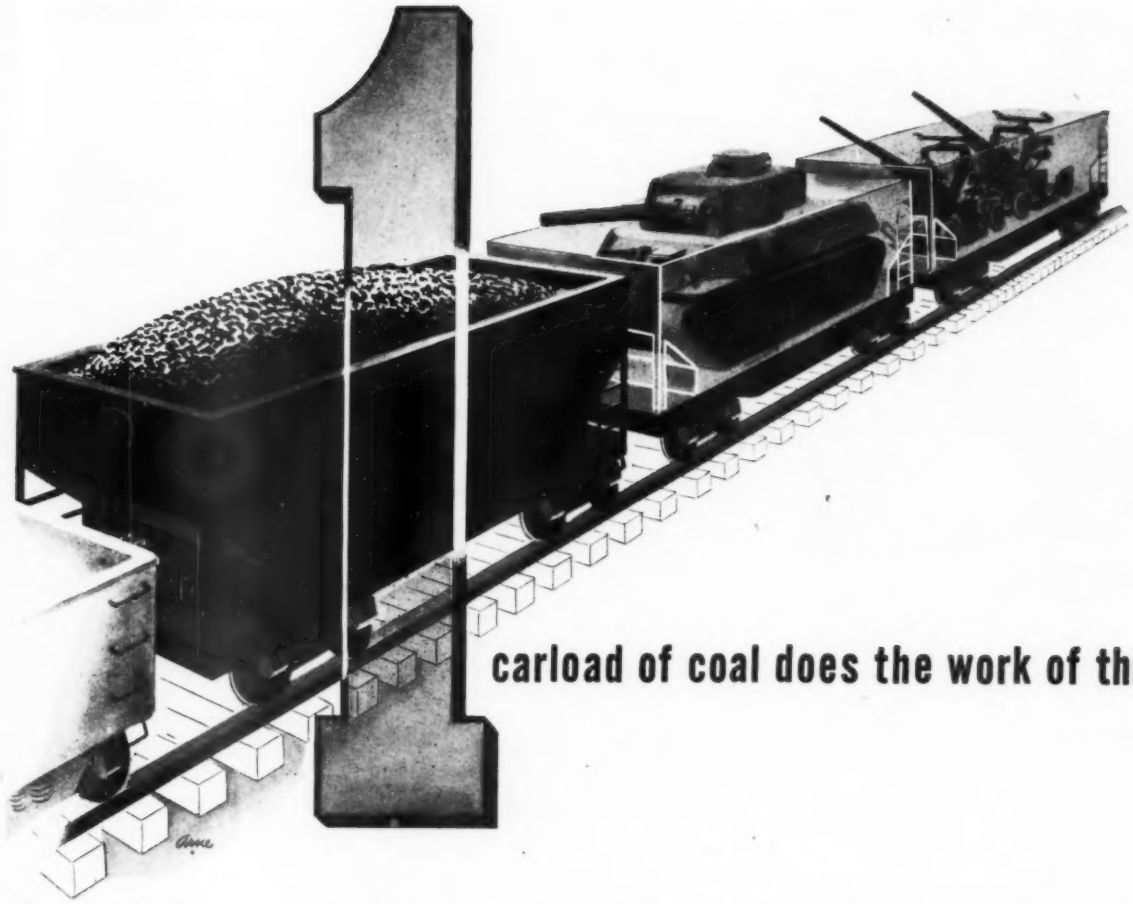
Four members are to be elected to the National Nominating Committee, to take posts vacated by Messrs. Locke, Hyde, Cunningham, and Fiske for Districts 1, 2, 4, and 5 respectively. The slate of nominees, one to be elected from each district, includes: *District 1:* Samuel C. Prescott, '94, V, Professor of Industrial Biology, Emeritus, M.I.T.; Frank P. Scully, '15, I, Scully Signal Company, Cambridge; Raymond H. Blanchard, '17, X, Hood Rubber Company, Watertown; *District 2:* Orville B. Denison, '11, VI, George S. May Company, Worcester; Leigh S. Hall, '14, II, Hall Brothers Company, Concord, N. H.; Robert C. Ashworth, Jr., '25, II, Ashworth Brothers, Fall River; *District 4:* Karl A. Pauly, '96, VI, Schenectady, N. Y.; Leon L. McGrady, '17, XV, Eastman Kodak Company, Rochester, N. Y.; Lauren B. Hitchcock, '20, X, Hooker Electrochemical Company, Niagara Falls, N. Y.; *District 5:* Frank Maguire, '17, V, Reichhold Chemicals, Inc., Elizabeth, N. J.; and C. George Dandrow, '22, IX-B, Johns-Manville Corporation, New York, N. Y.

Graduation No. 76

DESTINED to serve the nation in the armed forces and in war industries, 338 members of the Class of 1943 were graduated in Symphony Hall at the Institute's 76th graduation exercises on February 1. Under the accelerated academic program, this year's Class left the Institute four months before the traditional day of graduation. Degrees will be awarded in June to graduate students.

Nearly every man in the Class of 1943 had been placed before graduation. Approximately half will receive commissions in the Army, the Navy, and the Marine Corps: the remainder have entered engineering fields essential to the war effort. The aircraft industry took 38; electrical equipment companies gave positions to 28; the machinery, tool, and instrument industries took 17; and the same number entered the petroleum and chemical field. Eleven joined the swiftly accelerating synthetic rubber industry; nine went to Federal and state technical positions; seven were called to engineering posts in the shipbuilding industry; and teaching and research claimed seven. Six will remain at the Institute for graduate study, and six others went into the metallurgical field.

(*Continued on page 280*)



1 carload of coal does the work of three

The railroad coal car . . . a mute witness . . . reveals one contribution to the success of our global war that results from twenty years of progress in the generation of electrical energy.

In World War I it was necessary to burn 3.39* pounds of coal to produce one kilowatt hour (enough juice to light a 50 watt bulb for 20 hours). By contrast, the same amount of electricity is produced today from only 1.3* pounds of coal.

Thus, a single coal car, transporting fuel to a central station, now does the work of three. And our burdened railroads are relieved to haul two additional cars of tanks, guns or other munitions.

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*National Average of the Federal Power Commission for the years *1920* and *1941* respectively.

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FRANK B. SHIELDS, '07
EDWIN M. McNALLY, '18
LEON P. BREZINSKI, '29
RICHARD L. BERRY, '30

THE INSTITUTE GAZETTE

(*Continued from page 278*)

Members of the Reserve Officers' Training Corps, who because of the accelerated program will not receive their commissions until they complete further instruction at branch service or officer candidate schools, were given special recognition in the graduation exercises when they answered a roll call and saluted Colonel Edward W. Putney, Head of the Department of Military Science and Tactics.

Visiting Committee Report

THE Corporation Visiting Committee for the Department of English and History * surveys the work of that Department in the report summarized below as part of The Review's series:

Meeting last March 10, the Committee reviewed activities of the Department during the academic year 1941–1942. The program of instruction had been revised during that year to provide more emphasis on subjects which will give the students more of the background and nature of the war. Professor Arthur M. Schlesinger recommended that the courses include material which would give the students a better conception of American traditions and history in what might be called more normal times in contrast to the period 1929 to date, the events of which have stimulated many or most of the impressions of our present students.

The program for General Studies had been changed in such features as seemed most desirable in view of the present world situation. Robert G. Caldwell, Dean of Humanities, and the Faculty Committee on General Studies eliminated some subjects that were more technical than cultural in value and others that had a small enrollment. New courses having some bearing on the present situation were added. In this way, major alterations in the regular program of General Studies were avoided, but war problems received greater emphasis.

The space allotted to the Walker Memorial Library, both for reading and for the accommodation of a larger number of books, was justified by the greatly increased use of the library in the two years preceding the meeting. Efforts to encourage co-operation on the part of the secondary schools in the preparation of their students in English were increased during 1941–1942.

There appear to be a significant number of students enrolled at the Institute who are unable to read rapidly. This defect seems to arise from a real physical inhibition. It is quite possible that the ratio of such students to the total enrollment is greater at Technology than it is at the average college. A student may be capable or even brilliant in mathematics and other sciences and still fail to make a good record in English and history simply

(*Continued on page 282*)

* Members of the Committee for 1941–1942 were Philip W. Moore, '01, Chairman, James A. Tobey, '15, Edward P. Warner, '17, Fred T. Field, Roswell G. Ham, A. Lawrence Lowell, and Arthur M. Schlesinger.

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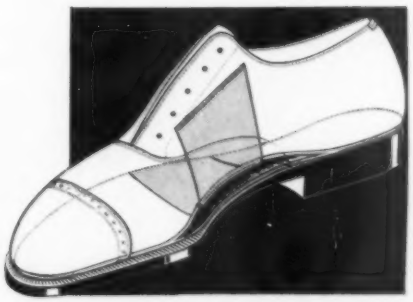

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THE INSTITUTE GAZETTE

(*Continued from page 280*)

because he cannot cover the ground so rapidly as the average student does. A study of this situation is being undertaken by the Department to the end that more information may be gathered about the number of students who are affected and some steps may be taken to help them overcome their difficulty.

Penfield Roberts, Associate Professor of History, submitted to the meeting a synopsis of courses in the humanities as presented at six of the other leading engineering schools of the country. The several programs were discussed in comparison with the program at the Institute. In so far as they could draw any conclusion from the consideration of the programs of the different schools, the Committee felt that the programs which might be considered preferable to that in effect at M.I.T. were those which provided more time in the later years for work in the humanities and in English composition.

The Committee feel that the Department is giving an excellent account of itself in promoting the interest of the students in the courses it has to offer and in keeping its work abreast of the times, under circumstances which in an engineering school might well tend to submerge the importance of its work.

Leonard Magruder Passano, 1866–1943

L. MAGRUDER PASSANO, Professor of Mathematics, Emeritus, a member of the Institute's Mathematics faculty for over 40 years, died at the age of 77 in Laguna Beach, Calif., on January 30, after a long illness. A native of Baltimore, he was graduated from Johns Hopkins University in 1889, his major studies having been in economics, mathematics, and English literature.

Professor Passano joined the staff of the Department of Mathematics at Technology in 1892, commencing a long and successful career of teaching which ended with his retirement in 1936. During these years, Professor Passano published a number of scientific articles as well as the textbooks *Plane and Spherical Trigonometry* and *Calculus and Graphs*.

(*Continued on page 284*)

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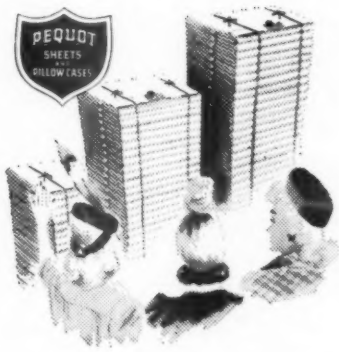

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THE INSTITUTE GAZETTE

(*Continued from page 282*)

His avocation was literature, in which field also he attained distinction — essays, poems, and plays giving proof of his versatility. On two occasions he was prize winner in the M.I.T. prize song contest. His interest in and devotion to the place of his birth are evident in two of his more important publications, a *History of Maryland* and *Maryland: Stories of Her People and of Her History*. Professor Passano was a member of the American Association for the Advancement of Science and of the Mathematical Association of America.

He is survived by his wife, Elizabeth Bissell Passano; a daughter, Mrs. John C. Cross of Laguna Beach, Calif.; and a son, Leonard M. Passano, Jr., '22, of New York City.

— RAYMOND D. DOUGLASS

Rogers Awards

WILLIAM BARTON ROGERS awards of $300, which are given annually in memory of the founder and first President of the Institute in recognition of high scholarship, character, and leadership in student affairs, were presented to four members of this year's graduating Class.

The recipients were Frank E. Briber, Jr., Denver, Colo.; Clinton C. Kemp, Cambridge, Mass.; Robert W. Maxwell, Braintree, Mass.; and Kenneth R. Wadleigh, Clifton, N. J.

Presentation of the awards was made by President Compton in a special ceremony attended by the Faculty Committee on Undergraduate Scholarships, of which Dean H. E. Lobdell, '17, is chairman, and the Heads of the academic Departments in which the students were studying.

Briber, a graduate of East High School, Denver, Colo., was in the Department of Metallurgy. He was chairman of the undergraduate Budget Committee and

(*Concluded on page 286*)

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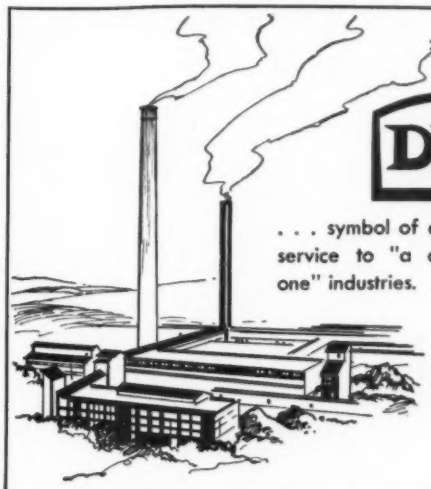

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THE INSTITUTE GAZETTE

(*Concluded from page 284*)

a member of the executive committee of the Institute Committee. He had been a member of the Interfraternity Conference and had served on the staff of the *Tech Engineering News*. His sports activities included basketball and track.

Kemp prepared for M.I.T. at the Royal Grammar School in Guildford, England. He took the Chemical Engineering Course and was President of the Technology Christian Association. He was a member of the Institute Committee and is a member of the American Institute of Chemical Engineers, the Army Ordnance Association, and the Chemical Society. He is also a member of the Advanced Reserve Officers' Training Corps.

Maxwell, who took the Course in Naval Architecture and Marine Engineering, was chairman of the Walker Memorial Committee. He prepared for the Institute at Braintree High School. He was also a member of the Student-Faculty Committee and of the executive committee of the Institute Committee. He was a member of the Quadrangle Club and Tau Beta Pi and was a member of the M.I.T. Nautical Association for two years. He was also a member of the editorial board of *The Tech*.

Wadleigh, who was president of the M.I.T. Athletic Association, entered the Institute from Clifton High School. He was in the Course in Mechanical Engineering, in which he was a member of the Honors Group. He was also a member of the Institute Committee and of Scabbard and Blade, the honorary military society. He was a member of the American Society of Mechanical Engineers, having served as president of the student chapter in his third year. He is a member of the Advanced Reserve Officers' Training Corps and was manager of the track team during his junior year.

THE TREND OF AFFAIRS

(*Concluded from page 232*)

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EMPLOYMENT STATUS	NUMBER	PER CENT
Army	98	28.9
Navy	61	18.0
Marines	3	.9
Applying Services	7	2.1
Federal	8	2.4
Industrial	148	43.8
Further Study	7	2.1
Unclassified	6	1.8
TOTALS	338	100.0

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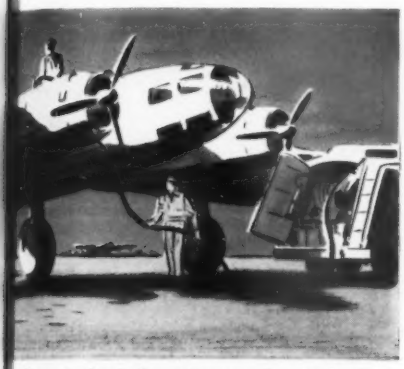
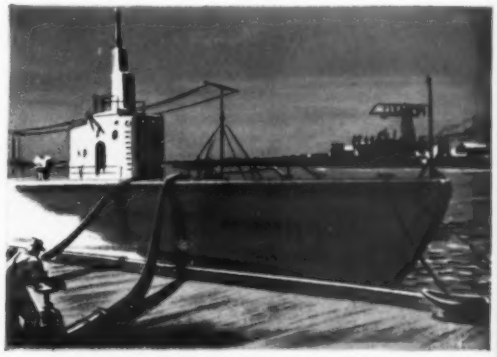
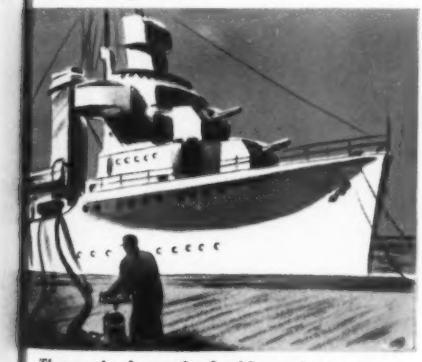


In a single airplane there are hundreds of rubber parts, including hose for fuel, oil lines and hydraulic controls; packings, and vibration dampeners.

Tanks need rubber at many points—rubber that will withstand heat, cold, oil, abrasion.



Submarines require acid-resisting rubber for battery compartments; other kinds of rubber in gaskets, mountings, and for scores of special applications.



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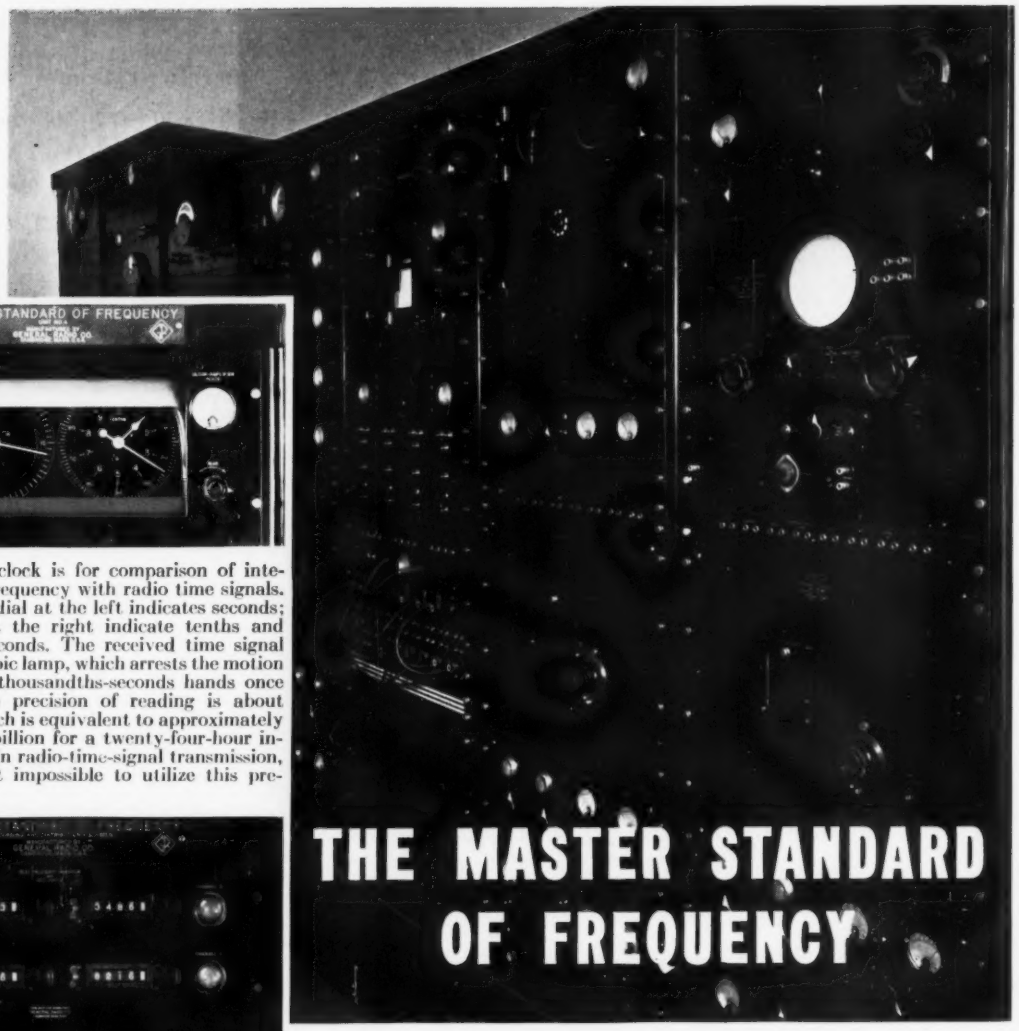

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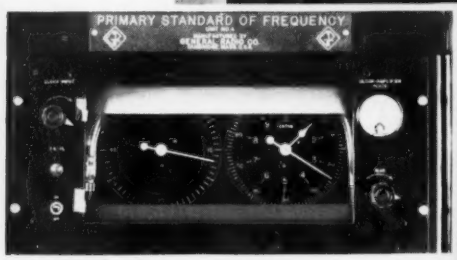

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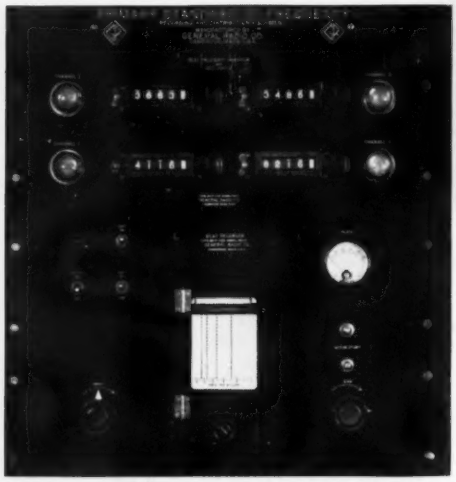

Note the recording panels which show the beats between pairs of oscillators. The deviation from a vertical line is a measure of the variation in frequency of one oscillator with respect to the other, as indicated by the scale at the bottom of the chart. The precision of reading can be increased or decreased if desired. Beats are recorded between each of four oscillators and a common reference oscillator. If all beat records show identical deviations, the reference oscillator is drifting, while if only one line deviates, the drift is in the oscillator being measured.

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